

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

JUL 28 1995

Department of the Navy
Chief, Naval Operation, (N-455)
ATTN: Executive Secretary
(CAPT Malinowski)
Navy Radiation Safety Committee
Washington, DC 20350-2000

Re: License SNM-00035

Dear Sir:

This letter is in reference to the property listed at the Naval Radiological Defense Laboratories, San Francisco, CA. The U.S. Nuclear Regulatory Commission has undertaken a review of over 31,000 previously terminated radioactive materials licenses throughout the United States. The purpose of the review is to confirm that there is documentation to show that licenses terminated before 1985 were terminated in accordance with current NRC criteria. The review has identified over 600 licenses for which there was insufficient documentation, in NRC's archived files to conclude that the license was terminated in accordance with today's criteria.

The property identified above was listed on such a license. Although NRC was initially unable to find a clearly documented basis to support the license termination, a search of our records, along with site surveys where necessary resolved our concerns about this property. To date, we have been able to find records for 233 sites of the 622 sites sufficient to close out our concerns about them. The above listed property is one of the 233 sites for which we have now been able to conclude that we have no remaining concerns on any residual contamination.

It is important for you to know that the entire list of licenses has been provided to Congress at its request and we understand that there are no current plans to release it to the public. You should also know that we will place a copy of this letter in our Public Document Room where it will be publicly available. As a result, you may be contacted by members of the news media. If you have questions about this letter, you may get in touch with the NRC contact listed below.

Sincerely,

Larry W. Camp
Donald A. Cool, Director
Division of Industrial and
Medical Nuclear Safety, NMSS

CONTACT: Dean Chaney
(510) 975-0229

cc: Edgar Bailey, CA Dept. of Health Services

9900
Ser 69 - 0516
9 April 1970

From: Commander, Naval Electronic Systems Command
To: Commander, Hunters Point Naval Shipyard
Attention Mr. R. C. Tartaul, Code H-140

Subj: AEC Special Nuclear Material License No. SIM-35

Ref: (a) FONECON between Mr. A. Kielwasser, HRDL Disestablishment
Group, and Mr. Mahaffey, NAVELECSYSCOMHQ on 6 MAR 1970

Encl: (1) AEC letter DML:RLL 70-35 of 6 APR 1970

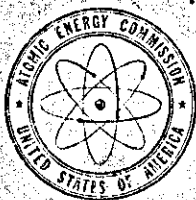
1. Enclosure (1) covers the termination of subject license and is being
forwarded in accordance with telephone conversation, reference (a).

Copy to:
BUMED, Code 74

04/P/A - MMD
C. S. HOLLANDER
By direction ✓

051 reading file

MAHAFFEY/mitchell
64157 - 4/9/70



DML:RLI
70-35

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 6 1970

Department of the Navy
Naval Electronics Systems Command
Washington, D. C. 20360

Attention: Mr. M. G. Williams

Gentlemen:

Your reference: 9900
SER 55 - 0516

In accordance with your application dated March 18, 1970, AEC
Special Nuclear Material License No. SNM-35 is hereby terminated.

FOR THE ATOMIC ENERGY COMMISSION

Robert L. Layfield
Robert L. Layfield
Source and Special Nuclear
Materials Branch
Division of Materials Licensing

DML:RLL
70-55

APR 6 1970

Department of the Navy
Naval Electronics Systems Command
Washington, D. C. 20360

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SER 55 - 0516

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FOR THE ATOMIC ENERGY COMMISSION

Original signed by
Robert L. Layfield

DISTRIBUTION:
PDR
Docket file
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A. Cabell, DR:ADM

Robert L. Layfield
Source and Special Nuclear
Materials Branch
Division of Materials Licensing

OFFICE ▶	DML						
SURNAME ▶	RL Layfield/dmb						
DATE ▶	4/6/70						

9900

Ser 55 - 0516

18 March 1970

FIRST ENDORSEMENT ON NAVSHIPYD HUNTERS POINT LETTER 140 11080 OF 9 MARCH 1970

From: Commander, Naval Electronic Systems Command
To: Chief
Source and Special Nuclear Materials Branch
Division of Materials Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subj: AEC Special Nuclear Material License No. SNM-35

1. Basic letter contains a request for termination of subject license.
2. The material has been reviewed and includes the disposition of special nuclear material held under AEC Material License No. SNM-35; submission of final material balance reports; and results of decontamination and final survey of laboratory facilities utilizing the special nuclear material.

6/8/70 - M. G. Williams

Copy to:
BUMED(Coda 74)
NAVSHIPYD, HUNTERS POINT
(Attn: R. C. Tartual)

M. G. WILLIAMS
By direction

051 reading file

MAHAFFEY/mitchell
61457 - 3/18/70

140
11080

MAR -9 1970

From: Commander, Hunters Point Naval Shipyard
To: Chief, Source and Special Nuclear Material Licensing,
U. S. Atomic Energy Commission, Washington, D. C. 20545

Recd 3/17/70

→ Via: Commander, Naval Electronic Systems Command (Code 05163)

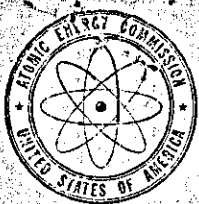
Subj: AEC Special Nuclear Material License No. SNM-35

1. Request that AEC Special Nuclear Material License No. SNM-35 issued to the Naval Radiological Defense Laboratory (NRDL) be terminated.
2. All special nuclear material held under subject license has been transferred to AEC activities, AEC, or State licensed activities.
3. Final material balance reports have been submitted to the AEC Materials Licensing Officer and to SS Directory Station LAA.
4. All NRDL facilities utilizing special nuclear material were completely surveyed. Where contamination was found, the contaminated components were either decontaminated, or removed and disposed of as radioactive waste. Upon completion of decontamination, no fixed alpha radioactivity was detected. The maximum level of fixed beta-gamma activity was less than twice background (0.04 millirad per hour). No measurable amount of removable alpha or beta-gamma activity was detected. None of the levels listed in "Radioactivity Limits for Unrestricted Release of Facilities and Equipment Contaminated with Source and/or Special Nuclear Material" was exceeded.

R. C. TARTUAL
By direction

Copy to:
BUREAU (Code 74)

Prepared by: Alfred Kielwasser, Physical Science Technician
(Health Physics), NRDL



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 30 1969

DML:LR
70-35

ACTION: 0516

INFO: DMV

FA 9900

0506-051-69

Department of the Navy
Naval Electronic Systems Command
Washington, D. C. 20360

Attention: Mr. C. S. Hollander

Your reference: 9900, Ser 38-0516

Gentlemen:

Enclosed is Special Nuclear Material License No. SNM-35, as renewed, covering the activities conducted by the U. S. Naval Radiological Defense Laboratory, San Francisco, California. Please note the attached leak test condition for sealed plutonium sources.

As stated in Condition 13, delivery of special nuclear material to a carrier for transport must be authorized pursuant to 10 CFR 71, notwithstanding the information presented on pages 18 and 19 of your submittal of July 1, 1968. Unless specifically authorized following receipt of an application filed pursuant to Section 71.21, delivery of any AEC licensed material to a carrier for transport must be in accordance with the exemptions of Section 71.5 or the general license provisions of Sections 71.6 and 71.7, 10 CFR 71, copy enclosed.

Condition No. 14 has been added to your license to cover those situations when the transport of special nuclear material is not subject to Department of Transportation (DOT) regulations. For example, an intra-state shipment not subject to DOT regulations would be authorized by this condition provided that the appropriate packaging, marking and labeling requirements are met.

Sincerely,

Leland C. Rouse
Source & Special Nuclear Materials
Branch
Division of Materials Licensing

Enclosures:
As stated

UNITED STATES
ATOMIC ENERGY COMMISSION

APR 30 1969

SPECIAL NUCLEAR MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 70, "Special Nuclear Material", a license is hereby issued authorizing the licensee to receive and possess the special nuclear material designated below; to use such special nuclear material for the purpose(s) and at the place(s) designated below; and to transfer such material to persons authorized to receive it in accordance with the regulations in said Part. This license shall be deemed to contain the conditions specified in Section 70.32(a) of said regulations, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee		3. License No. SNM-35
1. Name U. S. Naval Radiological Defense Laboratory		4. Expiration Date April 30, 1974
2. Address U. S. Naval Shipyard Hunters Point San Francisco, California 94135		5. Docket No. 70-35
6. Special Nuclear Material Plutonium; uranium 233; and uranium enriched in the U-235 isotope.	7. Maximum quantity of special nuclear material which licensee may possess at any one time under this license Plutonium: 2000 grams Pu-239 including 1019 grams as encapsulated neutron sources and 75 grams Pu-238 including 20 grams as a Pu-Pe neutron source; (continued below)	
8. Authorized use For use in accordance with the statements, representations and conditions specified in the licensee's application dated July 1, 1968, and supplement dated February 20, 1969.		

CONDITIONS

9. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.

The address stated in Item 2 above and any State in the United States.

7. (continued) U-233: 10 grams; U-235: 1000 grams.

MATERIAL LICENSE

License Number SNM-35

Supplementary Sheet

10. This license does not authorize the insertion of these materials into any nuclear reactor.
11. The licensee shall comply with the attached license condition for leak testing sealed plutonium sources.
12. The licensee is hereby exempted from the requirements of Section 70.24, 10 CFR 70, insofar as this Section applies to the material held under this license.
13. Notwithstanding information contained in the licensee's application dated July 1, 1968, incorporated in Item 8 above, this license does not authorize delivery of special nuclear material to a carrier for transport except as may be authorized pursuant to 10 CFR 71, Packaging of Radioactive Material for Transport.
14. The transportation of AEC-licensed material shall be subject to all applicable regulations of the Department of Transportation and other agencies of the United States having jurisdiction.

When Department of Transportation regulations in 49 CFR Parts 173 - 179 are not applicable to shipments by land of AEC-licensed material by reason of the fact that the transportation does not occur in interstate or foreign commerce, (1) the transportation shall be in accordance with the requirements relating to packaging of radioactive material, marking and labeling of the package, placarding of the transportation vehicle, and accident reporting set forth in the regulations of the Department of Transportation in § 173.389 - 173.399, 173.402, 173.414, 173.427, 49 CFR Part 173, "Shippers," and § 177.823, 177.842, 177.843, 177.861, 49 CFR Part 177, "Regulations Applying to Shipments Made By Way Of Common, Contract, Or Private Carriers By Public Highways," and (2) any requests for modifications or exceptions to those requirements, and any notifications referred to in those requirements shall be filed with, or made to, the Atomic Energy Commission.

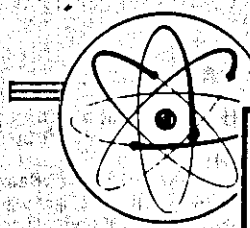
For the U. S. Atomic Energy Commission

by Leland C. Rouse
Leland C. RouseDate APR 30 1969Division of Materials Licensing
Washington, D. C. 20545

LICENSE CONDITION FOR LEAK TESTING

SEALED PLUTONIUM SOURCES

- A. Each plutonium source shall be tested for leakage at intervals not to exceed six (6) months. In the absence of a certificate from a transferor indicating that a test has been made within six (6) months prior to the transfer, the sealed source shall not be put into use until tested.
- B. The test shall be capable of detecting the presence of 0.005 microcurie of alpha contamination on the test sample. The test sample shall be taken from the source or from appropriate accessible surfaces of the device in which the sealed source is permanently or semipermanently mounted or stored. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Commission.
- C. If the test reveals the presence of 0.005 microcurie or more of removable alpha contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired by a person appropriately licensed to make such repairs or to be disposed of in accordance with the Commission regulations. Within five (5) days after determining that any source has leaked, the licensee shall file a report with the Director, Division of Materials Licensing, U. S. Atomic Energy Commission, Washington, D. C. 20545, describing the source, the test results, the extent of contamination, the apparent or suspected cause of source failure, and the corrective action taken. A copy of the report shall be sent to the Director of the nearest AEC Regional Compliance Office listed in Appendix D of Title 10, Code of Federal Regulations, Part 20.
- D. The periodic leak test required by this condition does not apply to sealed sources that are stored and not being used. The sources excepted from this test shall be tested for leakage prior to any use or transfer to another person unless they have been leak tested within six (6) months prior to the date of use or transfer.



UNITED STATES ATOMIC ENERGY COMMISSION

RULES and REGULATIONS • TITLE 10 - ATOMIC ENERGY

PART
71

PACKAGING OF RADIOACTIVE MATERIAL FOR TRANSPORT

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Subpart A—General Provisions

§ 71.1 Purpose.

(a) This part prescribes procedures and standards for approval by the Atomic Energy Commission of packaging and shipping procedures for fissile material (uranium 233, uranium 235, plutonium 238, plutonium 239, and plutonium 241) and for large quantities of licensed materials, as defined in § 71.4(f), and prescribes certain requirements governing such packaging and shipping.

(b) The packaging and transport of these materials is also subject to other parts of this chapter and to the regulations of other agencies having jurisdiction over means of transport. The requirements of this part are in addition to, and not in substitution for, other requirements.

§ 71.2 Scope.

The regulations in this part apply to all persons authorized by specific license issued by the Commission to receive, possess, use or transfer licensed materials, if they deliver such materials to a carrier for transport.

NOTE: For purposes of this regulation, a licensee who transports his own licensed material as a private carrier is considered to have delivered such material to a carrier for transport.

§ 71.3 Requirement for license.

No licensee subject to the regulations in this part shall deliver any licensed materials to a carrier for transport except as authorized in a general license or specific license issued by the Commission, or as exempted in this part.

§ 71.4 Definitions.

As used in this part:

(a) "Carrier" means any person engaged in the transportation of passengers or property, as common, contract, or private carrier, or freight forwarder, as those terms are used in the Interstate Commerce Act, as amended, or the U.S. Post Office;

(b) "Close reflection by water" means immediate contact by water of sufficient thickness to reflect a maximum number of neutrons;

(c) "Containment vessel" means the receptacle on which principal reliance is placed to retain the radioactive material during transport;

(d) "Fissile classification" means classification of a package or shipment of fissile materials according to the controls needed to provide nuclear criticality safety during transportation as follows:

(1) Fissile Class I: Packages which may be transported in unlimited numbers and in any arrangement, and which require no nuclear criticality safety controls during transportation. For purposes of nuclear criticality safety control, a transport index is not assigned to Fissile Class I packages. However, the external radiation levels may require a transport index number.

(2) Fissile Class II: Packages which may be transported together in any arrangement but in numbers which do not exceed an aggregate transport index of 50. For purposes of nuclear criticality safety control, individual packages may have a transport index of not less than 0.1 and not more than 10. However, the external radiation levels may require a higher transport index number but not to exceed 10. Such shipments require no nuclear criticality safety control by the shipper during transportation.

(3) Fissile Class III: Shipments of packages which do not meet the requirements of Fissile Classes I or II and which are controlled in transportation by special arrangements between the shipper and the carrier to provide nuclear criticality safety.

(e) "Fissile materials" means uranium 233, uranium 235, plutonium 238, plutonium 239, and plutonium 241;

Radionuclide identification	Transport group						Special form
	I	II	III	IV	V	VI	
Radioactivity.....(curies).....	20	20	200	200	5,000	50,000	5,000

December 31, 1968

PART 71 - PACKAGING OF RADIOACTIVE MATERIAL FOR TRANSPORT

(f) "Large quantity" means a quantity of radioactive material, the aggregate radioactivity of which exceeds any one of the following:

(1) For transport groups as defined in paragraph (p) of this section:

- (i) Group I or II radionuclides: 20 curies;
- (ii) Group III or IV radionuclides: 200 curies;
- (iii) Group V radionuclides: 5,000 curies;
- (iv) Group VI or VII radionuclides: 50,000 curies;

and

(2) For special form material as defined in paragraph (o) of this section: 5,000 curies.

(g) "Low specific activity material" means any of the following:

- (1) Uranium or thorium ores and physical or chemical concentrates of those ores;
- (2) Unirradiated natural or depleted uranium or unirradiated natural thorium;
- (3) Tritium oxide in aqueous solutions provided the concentration does not exceed 5.0 millicuries per milliliter;
- (4) Material in which the activity is essentially uniformly distributed and in which the estimated average concentration per gram of contents does not exceed:

- (i) 0.0001 millicurie of Group I radionuclides; or
- (ii) 0.005 millicurie of Group II radionuclides; or
- (iii) 0.3 millicurie of Groups III or IV radionuclides.

NOTE: This includes, but is not limited to, materials of low radioactivity concentration such as residues or solutions from chemical processing; wastes such as building rubble, metal, wood, and fabric scrap, glassware, paper, and cardboard; solid or liquid plant waste, sludges, and ashes.

(5) Objects of nonradioactive material externally contaminated with radioactive material, provided that the radioactive material is not readily dispersible and the surface contamination, when averaged over an area of 1 square meter, does not exceed 0.0001 millicurie (220,000 disintegrations per minute) per square centimeter of Group I radionuclides or 0.001 millicurie (2,200,000 disintegrations per minute) per square centimeter of other radionuclides.

(h) "Maximum normal operating pressure" means the maximum gauge pressure which is expected to develop in the containment vessel under the normal conditions of transport specified in Appendix A of this part;

(i) "Moderator" means a material used to reduce, by scattering collisions and without appreciable capture, the kinetic energy of neutrons;

(j) "Optimum interspersed hydrogenous moderation" means the occurrence of hydrogenous material between containment vessels to such an extent that the maximum nuclear reactivity results;

(k) "Package" means packaging and its radioactive contents;

(l) "Packaging" means one or more receptacles and wrappers and their contents excluding fissile material and other radioactive material, but including absorbent material, spacing structures, thermal insulation, radiation shielding, devices for cooling and for absorbing mechanical shock, external fittings, neutron moderators, nonfissile neutron absorbers, and other supplementary equipment;

(m) "Primary coolant" means a gas, liquid, or solid, or combination of them, in contact with the radioactive material or, if the material is in special form, in contact with its capsule, and used to remove decay heat;

(n) "Sample package" means a package which is fabricated, packed, and closed to fairly represent the proposed package as it would be presented for transport, simulating the material to be transported, as to weight and physical and chemical form;

(o) "Special form" means any of the following physical forms of licensed material of any transport group:

(1) The material is in solid form having no dimension less than 0.5 millimeter or at least one dimension greater than five millimeters; does not melt, sublime, or ignite in air at a temperature of 1,000° F.; will not shatter or crumble if subjected to the percussion test described in Appendix D of this part; and is not dissolved or converted into dispersible form to the extent of more than 0.005 percent by weight by immersion for 1 week in water at 68° F. or in air at 86° F.; or

(2) The material is securely contained in a capsule having no dimension less than 0.5 millimeter or at least one dimension greater than five millimeters, which will retain its contents if subjected to the tests prescribed in Appendix D of this part; and which is constructed of materials which do not melt, sublime, or ignite in air at 1,475° F., and do not dissolve or convert into dispersible form to the extent of more than 0.005 percent by weight by immersion for 1 week in water at 68° F. or in air at 86° F.

(p) "Transport group" means any one of seven groups into which radionuclides is normal form are classified, according to their toxicity and their relative potential hazard in transport, in Appendix C of this part.

(1) Any radionuclide not specifically listed in one of the groups in Appendix C shall be assigned to one of the Groups in accordance with the following table:

Radionuclide	Radioactive half-life		
	0 to 1000 days	1000 days to 10 ⁵ years	Over 10 ⁵ years
Atomic number 1-81	Group Iff...	Group H...	Group III.
Atomic number 82 and over.	Group I.....	Group I.....	Group III.

(2) For mixtures of radionuclides the following shall apply:

(i) If the identity and respective activity of each radionuclide are known, the permissible activity of each radionuclide shall be such that the sum, for all groups present, of the ratio be-

tween the total activity for each group to the permissible activity for each group will not be greater than unity.

(ii) If the groups of the radionuclides are known but the amount in each group cannot be reasonably determined, the mixture shall be assigned to the most restrictive group present.

(iii) If the identity of all or some of the radionuclides cannot be reasonably determined, each of those unidentified radionuclides shall be considered as belonging to the most restrictive group which cannot be positively excluded.

(iv) Mixtures consisting of a single radioactive decay chain where the radionuclides are in the naturally occurring proportions shall be considered as consisting of a single radionuclide. The group and activity shall be that of the first member present in the chain, except that if a radionuclide "x" has a half-life longer than that of that first member and an activity greater than that of any other member, including the first, at any time during transportation, the transport group of the nuclide "x" and the activity of the mixture shall be the maximum activity of that nuclide "x" during transportation.

Terms defined in Parts 20, 30 to 36 inclusive, and 70 of this chapter have the same meaning when used in this part.

§ 71.5 Exemptions.

A licensee is exempt from all of the requirements of this part to the extent that he delivers to a carrier for transport:

(a) Packages each of which contains no licensed material having a specific activity in excess of 0.002 $\mu\text{c}/\text{gram}$; or

(b) Packages each of which contains less than a large quantity of radioactive material, as defined in § 71.4(f), which may include one of the following:

(1) Not more than 15 grams of fissile material; or

(2) Thorium, or uranium containing not more than 0.72 percent by weight of fissile material; or

(3) Uranium compounds, other than metal, (e.g., UF₆, UF₄, or uranium oxide in bulk form, not pelleted or fabricated into shapes) or aqueous solutions of uranium, in which the total amount of uranium-233 and plutonium present does not exceed 1.0 percent by weight of the uranium-235 content, and the total fissile content does not exceed 1.00 percent by weight of the total uranium content; or

(4) Homogeneous hydrogenous solutions or mixtures containing not more than:

(i) 500 grams of any fissile material, provided the atomic ratio of hydrogen to fissile material is greater than 7600; or

PART 71 - PACKAGING OF RADIOACTIVE MATERIAL FOR TRANSPORT

(ii) 800 grams of uranium-235: *Provided*, That the atomic ratio of hydrogen to fissile material is greater than 5200, and the content of other fissile material is not more than 1 percent by weight of the total uranium-235 content; or

(iii) 500 grams of uranium-233 and uranium-235: *Provided*, That the atomic ratio of hydrogen to fissile material is greater than 5200, and the content of plutonium is not more than 1 percent by weight of the total uranium-233 and uranium-235 content; or

(5) Less than 350 grams of fissile material: *Provided*, That there is not more than 5 grams of fissile material in any cubic foot within the package.

(2) No package contains fissile material in excess of the amounts specified in the following table, and each package is labeled with the corresponding transport index:

Maximum quantity of fissile material in a single package				Corresponding transport index
U-235 (grams)	U-233 (grams)	Plutonium (grams)	Plutonium as Pu-Be neutron sources (grams)	
35-40	27-30	23-25	320-400	10
30-35	24-27	21-23	240-320	8
25-30	21-24	19-21	160-240	6
20-25	18-21	17-19	80-160	4
15-20	15-18	15-17	15-80	2

NOTE. Combinations of fissile materials are authorized. For combinations of fissile materials, the transport index is the sum of the individual corresponding transport indexes. The total transport index shall not exceed 10.

§ 71.7 General license for shipment in DOT specification containers.

A general license is hereby issued, to persons holding a general or specific license issued pursuant to this chapter, to deliver licensed material to a carrier for transport in a specification container for fissile material as specified in § 173.396 (b) or (c) or for a large quantity of radioactive material as specified in § 173.394(c) or § 173.395(c) of the regulations of the Department of Transportation, 49 CFR Part 173.

§ 71.8 Communications.

All communications concerning the regulations in this part should be addressed to the Atomic Energy Commission, Washington, D.C. 20545, Attention: Director, Division of Materials Licensing, or may be delivered in person at the Commission's offices at 1717 H Street NW., Washington, D.C., its offices at Germantown, Md., or its offices at 4915 St. Elmo Street, Bethesda, Md.

§ 71.9 Interpretations.

Except as specifically authorized by the Commission in writing, no interpretation of the meaning of the regulations in this part by an officer or employee of the Commission other than a written interpretation by the General Counsel will be recognized to be binding on the Commission.

§ 71.10 Additional requirements.

The Commission may by rule, regulation, or order impose upon any licensee such requirements, in addition to those established in this part, as it deems necessary or appropriate to protect health or to minimize danger to life or property.

§ 71.11 Specific exemptions.

On application of any interested person or on its own initiative, the Commission may grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security.

§ 71.12 Limited exemption for shipment of special nuclear material.

(a) A licensee who on the effective date of this section is the holder of a specific license authorizing the delivery of special nuclear material to a carrier for transport, may continue to do so under the conditions specified in the license during its term, except as provided in this section.

(b) Such a licensee shall within 3 months after the effective date of this section file a consolidated application for a superseding license in accordance with this part as amended. If the licensee fails to do so, the authority granted by the license to deliver special nuclear material to a carrier for transport shall thereupon expire. The Commission may issue a new license superseding the existing license, may confirm the existing license with or without modification, or may deny the application in whole or in part and terminate the existing license in whole or in part.

§ 71.13 Limited exemption for shipment of large quantities of licensed material.

A person delivering a large quantity of licensed material, as defined in § 71.4(f), to a carrier for transport is exempted from the requirements of this part until 3 months after its effective date. The exemption granted by this section shall thereupon terminate except as to activities described in an application for a license which the person has prior to that time filed with the Commission. If the person has filed such an application, the exemption granted by this section shall continue until the application has been finally determined by the Commission.

§ 71.14 Amendment of existing licenses.

AEC licenses issued pursuant to this part and in effect on October 4, 1968, which authorize Fissile Class II packages are hereby amended by increasing the minimum number of units specified for each Fissile Class II package by a factor of 1.25. The new number shall be rounded up to the first decimal. In addition, the term "radiation units" is changed to "transport index" wherever used in the license.

§ 71.6 General license for shipment of licensed material.

A general license is hereby issued, to persons holding specific licenses issued pursuant to this chapter, to deliver licensed material to a carrier for transport, without complying with the package standards of Subpart C of this part, when either:

(a) The material is shipped as a Fissile Class III shipment with the following limitations on its contents:

(1) No single package contains a large quantity of licensed material, as defined in § 71.4(f); and

(2) The fissile material contents of the shipment do not exceed:

(i) 500 grams of uranium 235; or
(ii) 300 grams total of uranium 233, plutonium 238, plutonium 239, and plutonium 241; or

(iii) Any combination of uranium 233, uranium 235, and plutonium in such quantities that the sum of the ratios of the quantity of each of them to the quantity specified in subdivisions (i) and (ii) of this subparagraph does not exceed unity; or

(iv) 2500 grams of plutonium 238, plutonium 239, and plutonium 241 encapsulated as plutonium-beryllium neutron sources, with no one package containing in excess of 400 grams of plutonium 238, plutonium 239, and plutonium 241; or

(b) The material is shipped as Fissile Class II packages with the following limitations on the contents of each package:

(1) No package contains a large quantity of licensed material, as defined in § 71.4(f); and

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Subpart B—License Applications

§ 71.21 Contents of application.

An application for a specific license under this part may be submitted as an application for a license or license amendment under this chapter and shall include, for each proposed packaging design and method of transport, the following information in addition to any otherwise required:

- (a) A package description as required by § 71.22;
- (b) A package evaluation as required by § 71.23;
- (c) A description of proposed procedural controls as required by § 71.24;
- (d) In the case of fissile material, an identification of the proposed fissile class.

§ 71.22 Package description.

The application shall include a description of the proposed package in sufficient detail to identify the package accurately and to provide a sufficient basis for evaluation of the packaging. The description should include:

- (1) With respect to the packaging:
 - (i) Gross weight;
 - (ii) Model number;
 - (iii) Specific materials of construction, weights, dimensions, and fabrication methods of:
 - (i) Receptacles, identifying the one which is considered to be the containment vessel;
 - (ii) Materials specifically used as non-fissile neutron absorbers or moderators;
 - (iii) Internal and external structures supporting or protecting receptacles;
 - (iv) Valves, sampling ports, lifting devices, and tie-down devices;
 - (v) Structural and mechanical means for the transfer and dissipation of heat; and
 - (iv) Identification and volumes of any coolants and of receptacles containing coolant.
- (b) With respect to the contents of the package:
 - (1) Identification and maximum radioactivity of radioactive constituents;
 - (2) Identification and maximum quantities of fissile constituents;
 - (3) Chemical and physical form;
 - (4) Extent of reflection, the amount and identity of non-fissile neutron absorbers in the fissile constituents, and the atomic ratio of moderator to fissile constituents;
 - (5) Maximum weight; and
 - (6) Maximum amount of decay heat.

§ 71.23 Package evaluation.

The applicant shall:

- (a) Demonstrate that the package satisfies the standards specified in Subpart C;
- (b) For a Fissile Class II package, ascertain and specify the number of similar packages which may be transported together in accordance with § 71.39; and
- (c) For a Fissile Class III shipment, describe any proposed special controls and precautions to be exercised during transport, loading, unloading, and handling, and in the event of accident or delay.

§ 71.24 Procedural controls.

The applicant shall describe the regular and periodic inspection procedures proposed to comply with § 71.51(b).

§ 71.25 Additional information.

The Commission may at any time require further information in order to enable it to determine whether a license should be granted, denied, modified, suspended, or revoked.

Subpart C—Package Standards

§ 71.31 General standards for all packaging.

(a) Packaging shall be of such materials and construction that there will be no significant chemical, galvanic, or other reaction among the packaging components, or between the packaging components and the package contents.

(b) Packaging shall be equipped with a positive closure which will prevent inadvertent opening.

(c) Lifting devices:

(1) If there is a system of lifting devices which is a structural part of the package, the system shall be capable of supporting three times the weight of the loaded package without generating stress in any material of the packaging in excess of its yield strength.

(2) If there is a system of lifting devices which is a structural part only of the lid, the system shall be capable of supporting three times the weight of the lid and any attachments without generating stress in any material of the lid in excess of its yield strength.

(3) If there is a structural part of the package which could be employed to lift the package and which does not comply with subparagraph (1) of this paragraph, the part shall be securely covered or locked during transport in such a manner as to prevent its use for that purpose.

(4) Each lifting device which is a structural part of the package shall be so designed that failure of the device under excessive load would not impair the containment or shielding properties of the package.

(d) Tie-down devices:

(1) If there is a system of tie-down devices which is a structural part of the package, the system shall be capable of withstanding, without generating stress in any material of the package in excess of its yield strength, a static force applied to the center of gravity of the package having a vertical component of two times the weight of the package with its contents, a horizontal component along the direction in which the vehicle travels of 10 times the weight of the package with its contents, and a horizontal component in the transverse direction of 5 times the weight of the package with its contents.

(2) If there is a structural part of the package which could be employed to tie the package down and which does not comply with subparagraph (1) of this paragraph, the part shall be securely covered or locked during transport in such a manner as to prevent its use for that purpose.

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(3) Each tie-down device which is a structural part of the package shall be so designed that failure of the device under excessive load would not impair the ability of the package to meet other requirements of this subpart.

§ 71.32 Structural standards for large quantity packaging.

Packaging used to ship a large quantity of licensed material, as defined in § 71.4(f), shall be designed and constructed in compliance with the structural standards of this section. Standards different from those specified in this section may be approved by the Commission if the controls proposed to be exercised by the shipper are demonstrated to be adequate to assure the safety of the shipment.

(a) *Load resistance.* Regarded as a simple beam supported at its ends along any major axis, packaging shall be capable of withstanding a static load, normal to and uniformly distributed along its length, equal to 5 times its fully loaded weight, without generating stress in any material of the packaging in excess of its yield strength.

(b) *External pressure.* Packaging shall be adequate to assure that the containment vessel will suffer no loss of contents if subjected to an external pressure of 25 pounds per square inch gauge.

§ 71.33 Criticality standards for fissile material packages.

(a) A package used for the shipment of fissile material shall be so designed and constructed and its contents so limited that it would be subcritical if it is assumed that water leaks into the containment vessel, and:

(1) Water moderation of the contents occurs to the most reactive credible extent consistent with the chemical and physical form of the contents; and

(2) The containment vessel is fully reflected on all sides by water.

(b) A package used for the shipment of fissile material shall be so designed and constructed and its contents so limited that it would be subcritical if it is assumed that any contents of the package which are liquid during normal transport leak out of the containment vessel, and that the fissile material is then:

(1) In the most reactive credible configuration consistent with the chemical and physical form of the material;

(2) Moderated by water outside of the containment vessel to the most reactive credible extent; and

(3) Fully reflected on all sides by water.

(c) The Commission may approve exceptions to the requirements of this section where the containment vessel incorporates special design features which would preclude leakage of liquids in spite of any single packaging error and appropriate measures are taken before each shipment to verify the leak tightness of each containment vessel.

§ 71.34 Evaluation of a single package.

(a) The effect of the transport environment or the safety of any single

package of radioactive material shall be evaluated as follows:

(1) The ability of a package to withstand conditions likely to occur in normal transport shall be assessed by subjecting a sample package or scale model, by test or other assessment, to the normal conditions of transport as specified in § 71.35; and

(2) The effect on a package of conditions likely to occur in an accident shall be assessed by subjecting a sample package or scale model, by test or other assessment, to the hypothetical accident conditions as specified in § 71.36.

(b) Taking into account controls to be exercised by the shipper, the Commission may permit the shipment to be evaluated together with or without the transporting vehicle, for the purpose of one or more tests.

(c) Normal conditions of transport and hypothetical accident conditions different from those specified in § 71.35 and § 71.36 may be approved by the Commission if the controls proposed to be exercised by the shipper are demonstrated to be adequate to assure the safety of the shipment.

§ 71.35 Standards for normal conditions of transport for a single package.

(a) A package used for the shipment of fissile material or a large quantity of licensed material, as defined in § 71.4(f), shall be so designed and constructed and its contents so limited that under the normal conditions of transport specified in Appendix A of this part:

(1) There will be no release of radioactive material from the containment vessel;

(2) The effectiveness of the packaging will not be substantially reduced;

(3) There will be no mixture of gases or vapors in the package which could, through any credible increase of pressure or an explosion, significantly reduce the effectiveness of the packaging;

(4) Radioactive contamination of the liquid or gaseous primary coolant will not exceed 10^{-7} curies of activity of Group I radionuclides per milliliter, 5×10^{-4} curies of activity of Group II radionuclides per milliliter, 3×10^{-4} curies of activity of Group III and Group IV radionuclides per milliliter; and

(5) There will be no loss of coolant.

(b) A package used for the shipment of fissile material shall be so designed and constructed and its contents so limited that under the normal conditions of transport specified in Appendix A of this part:

(1) The package will be subcritical;

(2) The geometric form of the package contents would not be substantially altered;

(3) There will be no leakage of water into the containment vessel. This requirement need not be met if, in the evaluation of undamaged packages under § 71.38(a), § 71.39(a)(1), or § 71.40(a), it has been assumed that moderation is present to such an extent as to cause maximum reactivity consistent with the chemical and physical form of the material; and

(4) There will be no substantial reduction in the effectiveness of the packaging, including:

(i) Reduction by more than 5 percent in the total effective volume of the packaging on which nuclear safety is assessed;

(ii) Reduction by more than 5 percent in the effective spacing on which nuclear safety is assessed, between the center of the containment vessel and the outer surface of the packaging; or

(iii) Occurrence of any aperture in the outer surface of the packaging large enough to permit the entry of a 4-inch cube.

(c) A package used for the shipment of a large quantity of licensed material, as defined in § 71.4(f), shall be so designed and constructed and its contents so limited that under the normal conditions of transport specified in Appendix A of this part, the containment vessel would not be vented directly to the atmosphere.

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§ 71.36 Standards for hypothetical accident conditions for a single package.

(a) A package used for the shipment of a large quantity of radioactive material, as defined in § 71.4(f), or for the shipment of fissile material when the package will contain more than 0.001 curie of Group I radionuclides, 0.05 curie of Group II radionuclides, 3 curies of Group III radionuclides, 20 curies of Group IV or Group V radionuclides or radionuclides in special form, or 1,000 curies of Group VI or Group VII radionuclides shall be so designed and constructed and its contents so limited that if subjected to the hypothetical accident

conditions specified in Appendix B of this part as the Free Drop, Puncture, Thermal, and Water Immersion conditions in the sequence listed in Appendix B, it will meet the following conditions:

(1) The reduction of shielding would not be sufficient to increase the external radiation dose rate to more than 1,000 millirems per hour at 3 feet from the external surface of the package.

(2) No radioactive material would be released from the package except for gases and contaminated coolant containing total radioactivity exceeding neither:

(i) 0.1 percent of the total radioactivity of the package contents; nor

(ii) 0.01 curie of Group I radionuclides, 0.5 curie of Group II radionuclides, 10 curies of Group III radionuclides, 10 curies of Group IV radionuclides, and 1,000 curies of inert gases irrespective of transport group.

A package need not satisfy the requirements of this paragraph if it contains only low specific activity materials, as defined in § 71.4(g), and is transported on a motor vehicle, railroad car, aircraft, inland water craft, or hold or deck of a seagoing vessel assigned for the sole use of the licensee.

(b) A package used for the shipment of fissile material shall be so designed and constructed and its contents so limited that if subjected to the hypothetical accident conditions specified in Appendix B of this part as the Free Drop, Punc-

ture, Thermal, and Water Immersion conditions, in the sequence listed in Appendix B, the package would be subcritical. In determining whether this standard is satisfied, it shall be assumed that:

(1) The fissile material is in the most reactive credible configuration consistent with the damaged condition of the package and the chemical and physical form of the contents;

(2) Water moderation occurs to the most reactive credible extent consistent with the damaged condition of the package and the chemical and physical form of the contents; and

(3) There is reflection by water on all sides and as close as is consistent with the damaged condition of the package.

§ 71.37 Evaluation of an array of packages of fissile material.

(a) The effect of the transport environment on the nuclear safety of an array of packages of fissile material shall be evaluated by subjecting a sample package or a scale model, by test or other assessment, to the hypothetical accident conditions specified in § 71.38, § 71.39, or § 71.40 for the proposed fissile class, and by assuming that each package in the array is damaged to the same extent as the sample package or scale model. In the case of a Fissile Class III shipment, the Commission may, taking into account controls to be exercised by the shipper, permit the shipment to be evaluated as a whole rather than as individual packages, and either with or without the transporting vehicle, for the purpose of one or more tests.

(b) In determining whether the standards of §§ 71.38(b), 71.39(a)(2), and 71.40(b) are satisfied, it shall be assumed that:

(1) The fissile material is in the most reactive credible configuration consistent with the damaged condition of the package, the chemical and physical form of the contents, and controls exercised over the number of packages to be transported together; and

(2) Water moderation occurs to the most reactive credible extent consistent with the damaged condition of the package and the chemical and physical form of the contents.

§ 71.38 Specific standards for a Fissile Class I package.

A Fissile Class I package shall be so designed and constructed and its contents so limited that:

(a) Any number of such undamaged packages would be subcritical in any arrangement, and with optimum interspersed hydrogenous moderation unless there is a greater amount of interspersed moderation in the packaging, in which case that greater amount may be considered; and

(b) Two hundred fifty such packages would be subcritical in any arrangement, if each package were subjected to the

hypothetical accident conditions specified in Appendix B of this part as the Free Drop, Thermal, and Water Immersion conditions, in the sequence listed in Appendix B, with close reflection by water on all sides of the array and with optimum interspersed hydrogenous moderation unless there is a greater amount of interspersed moderation in the packaging, in which case that greater amount may be considered. The condition of the package shall be assumed to be as described in § 71.37.

§ 71.39 Specific standards for a Fissile Class II package.

(a) A Fissile Class II package shall be so designed and constructed and its contents so limited, and the number of such packages which may be transported together so limited, that:

(1) Five times that number of such undamaged packages would be subcritical in any arrangement if closely reflected by water; and

(2) Twice that number of such packages would be subcritical in any arrangement if each package were subjected to the hypothetical accident conditions specified in Appendix B of this part as the Free Drop, Thermal, and Water Immersion conditions, in the sequence listed in Appendix B, with close reflection by water on all sides of the array and with optimum interspersed hydrogenous moderation unless there is a greater amount of interspersed moderation in the packaging, in which case that greater amount may be considered. The condition of the package shall be assumed to be as described in § 71.37.

(b) The transport index for each Fissile Class II package is calculated by dividing the number 50 by the number of such Fissile Class II packages which may be transported together as determined under the limitations of paragraph (a) of this section. The calculated number shall be rounded up to the first decimal place.

§ 71.40 Specific standards for a Fissile Class III shipment.

A package for Fissile Class III shipment shall be so designed and constructed and its contents so limited, and the number of packages in a Fissile Class III shipment shall be so limited, that:

(a) The undamaged shipment would be subcritical with an identical shipment in contact with it and with the two shipments closely reflected on all sides by water; and

(b) The shipment would be subcritical if each package were subjected to the hypothetical accident conditions specified in Appendix B of this part as the Free Drop, Thermal, and Water Immersion conditions, in the sequence listed in Appendix B, with close reflection by water on all sides of the array and with the packages in the most reactive arrangement and with the most reactive degree of interspersed hydrogenous moderation which would be credible con-

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sidering the controls to be exercised over the shipment. The condition of the package shall be assumed to be as described in § 71.37. Hypothetical accident conditions different from those specified in this paragraph may be approved by the Commission if the controls proposed to be exercised by the shipper are demonstrated to be adequate to assure the safety of the shipment.

§ 71.41 Previously constructed packages for irradiated solid nuclear fuel.

Notwithstanding any other provisions of this Subpart, a package, the use of which has been authorized by the Commission for the transport of irradiated solid nuclear fuel on or after September 23, 1961, and which has been completely constructed prior to January 1, 1967, shall be deemed to comply with the package standards of this subpart for that purpose.

Subpart D—Operating Procedures

§ 71.51 Establishment and maintenance of procedures.

The licensee shall establish and maintain:

(a) Operating procedures adequate to assure that the determinations and controls required by this chapter are accomplished; and

(b) Regular and periodic inspection procedures adequate to assure that the licensee follows the procedures required by paragraph (a) of this section.

§ 71.52 Assumptions as to unknown properties.

When the isotopic abundance, mass, concentration, degree of irradiation, degree of moderation, or other pertinent property of fissile material in any package is not known, the licensee shall package the fissile material as if the unknown properties have such credible values as will cause the maximum nuclear reactivity.

§ 71.53 Preliminary determinations.

(a) Prior to the first use of any packaging for the shipment of licensed materials, the licensee shall ascertain that there are no cracks, pinholes, uncontrolled voids or other defects which could significantly reduce the effectiveness of the packaging.

(b) Prior to the first use of any packaging for the shipment of licensed materials, where the maximum normal operating pressure will exceed 5 pounds per square inch gauge, the licensee shall test the containment vessel to assure that it will not leak at an internal pressure 50 percent higher than the maximum normal operating pressure.

(c) Packaging shall be conspicuously and durably marked with its model number. Prior to applying the model number, the licensee shall determine that the packaging has been fabricated in accordance with the design approved by the Commission.

§ 71.54 Routine determinations.

Prior to each use of a package for shipment of licensed material the licensee shall ascertain that the package with its contents satisfies the applicable requirements of Subpart C of this part and of the license, including determinations that:

(a) The packaging has not been significantly damaged;

(b) Any moderators and nonfissile neutron absorbers, if required, are present and are as authorized by the Commission;

(c) The closure of the package and any sealing gaskets are present and are free from defects;

(d) Any valve through which primary coolant can flow is protected against tampering;

(e) The internal gauge pressure of the package will not exceed, during the anticipated period of transport, the maximum normal operating pressure;

(f) Contamination of the primary coolant will not exceed, during the anticipated period of transport, the limits specified in § 71.35(a)(4).

The provisions of this section shall not be applicable for packages authorized in the general licenses granted by § 71.6. In such cases the licensee shall ascertain that the contents of the package are as authorized in the general license.

§ 71.61 Reports.

The licensee shall report to the Division of Materials Licensing, U.S. Atomic Energy Commission, Washington, D.C. 20545, within 30 days any instance in which there is substantial reduction in the effectiveness of any authorized packaging during use.

§ 71.62 Records.

(a) The licensee shall maintain for a period of 2 years after its generation a record of each shipment of fissile material and of a large quantity of licensed material, as defined in § 71.4(f), in a single package, showing, where applicable:

(1) Identification of the packaging by model number;

(2) Details of any significant defects in the packaging, with the means employed to repair the defects and prevent their recurrence;

(3) Volume and identification of coolant;

(4) Type and quantity of licensed material in each package, and the total quantity in each shipment;

(5) For each item of irradiated fissile material:

(i) Identification by model number;

(ii) Irradiation and decay history to the extent appropriate to demonstrate that its nuclear and thermal characteristics comply with license conditions;

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- (iii) Any abnormal or unusual condition relevant to radiation safety.
 (6) Date of the shipment;
 (7) For Fissile Class III, any special controls exercised;
 (8) Name and address of the transferee;
 (9) Address to which the shipment was made; and
 (10) Results of the determinations required by §§ 71.53 and 71.54.

(b) The licensee shall make available to the Commission for inspection, upon reasonable notice, all records required by this part.

§ 71.63 Inspection and tests.

(a) The licensee shall permit the Commission at all reasonable times to inspect the licensed material, packaging, and premises and facilities in which the licensed material or packaging are used, produced, tested, stored or shipped.

(b) The licensee shall perform, and permit the Commission to perform, such tests as the Commission deems necessary or appropriate for the administration of the regulations in this chapter.

§ 71.64 Violations.

An injunction or other court order may be obtained prohibiting any violation of any provision of the Act or any regulation or order issued thereunder. Any person who wilfully violates any provision of the Act or any regulation or order issued thereunder may be guilty of a crime and upon conviction may be punished by fine or imprisonment, or both as provided by law.

APPENDIX A—NORMAL CONDITIONS OF TRANSPORT

Each of the following normal conditions of transport is to be applied separately to determine its effect on a package.

- Heat**—Direct sunlight at an ambient temperature of 130° F. in still air.
- Cold**—An ambient temperature of -40° F. in still air and shade.
- Pressure**—Atmospheric pressure of 0.5 times standard atmospheric pressure.
- Vibration**—Vibration normally incident to transport.
- Water Spray**—A water spray sufficiently heavy to keep the entire exposed surface of the package except the bottom continuously wet during a period of 30 minutes.
- Free Drop**—Between 1½ and 2½ hours after the conclusion of the water spray test, a free drop through the distance specified below onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected.

FREE FALL DISTANCE

Package weight (pounds)	Distance (feet)
Less than 10,000	4
10,000 to 20,000	3
20,000 to 30,000	2
More than 30,000	1

7. **Corner Drop**—A free drop onto each corner of the package in succession, or in the case of a cylindrical package onto each quarter of each rim, from a height of 1 foot onto a flat essentially unyielding horizontal surface. This test applies only to packages which are constructed primarily of wood or fiberboard, and do not exceed 110 pounds gross weight, and to all Fissile Class II packagings.

8. **Penetration**—Impact of the hemispherical end of a vertical steel cylinder 1½ inches in diameter and weighing 13 pounds, dropped from a height of 40 inches onto the exposed surface of the package which is expected to be most vulnerable to puncture. The long axis of the cylinder shall be perpendicular to the package surface.

9. **Compression**—For packages not exceeding 10,000 pounds in weight, a compressive load equal to either 5 times the weight of the package or 2 pounds per square inch multiplied by the maximum horizontal cross section of the package, whichever is greater. The load shall be applied during a period of 24 hours, uniformly against the top and bottom of the package in the position in which the package would normally be transported.

APPENDIX B—HYPOTHETICAL ACCIDENT CONDITIONS

The following hypothetical accident conditions are to be applied sequentially, in the order indicated, to determine their cumulative effect on a package or array of packages.

1. **Free Drop**—A free drop through a distance of 30 feet onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected.

2. **Puncture**—A free drop through a distance of 40 inches striking, in a position for which maximum damage is expected, the top end of a vertical cylindrical mild steel bar mounted on an essentially unyielding horizontal surface. The bar shall be 6 inches in diameter, with the top horizontal and its edge rounded to a radius of not more than one-quarter inch, and of such a length as to cause maximum damage to the package, but not less than 8 inches long. The long axis of the bar shall be perpendicular to the unyielding horizontal surface.

3. **Thermal**—Exposure to a thermal test in which the heat input to the package is not less than that which would result from exposure of the whole package to a radiation environment of 1,475° F. for 30 minutes with an emissivity coefficient of 0.9, assuming the surfaces of the package have an absorption coefficient of 0.8. The package shall not be cooled artificially until 3 hours after the test period unless it can be shown that the temperature on the inside of the package has begun to fall in less than 3 hours.

4. **Water Immersion** (fissile material packages only)—Immersion in water to the extent that all portions of the package to be tested are under at least 3 feet of water for a period of not less than 3 hours.

APPENDIX C—TRANSPORT GROUPING OF RADIONUCLIDES

Element*	Radionuclide***	Group
Actinium (89)	Ac 227	I
	Ac 228	I
Americium (95)	Am 241	I
	Am 243	I
Antimony (51)	Sb 122	IV
	Sb 124	III
	Sb 125	III
Argon (18)	Ar 37	VI
	Ar 41	II
	Ar 41 (uncompressed)**	V
Arsenic (33)	As 73	IV
	As 74	IV
	As 76	IV
	As 77	IV
Astatine (85)	At 211	III
Barium (56)	Ba 131	IV
	Ba 133	II
	Ba 140	III

See footnotes at end of table.

APPENDIX C—TRANSPORT GROUPING OF RADIONUCLIDES—Continued

Element*	Radionuclide***	Group
Berkellium (97)	Bk 249	I
Beryllium (4)	Be 7	IV
Bismuth (83)	Bi 206	III
	Bi 207	III
	Bi 210	II
	Bi 212	IV
Bromine (35)	Br 82	IV
Cadmium (48)	Cd 109	IV
	Cd 115 m	III
	Cd 115	IV
Calcium (20)	Ca 45	IV
	Ca 47	IV
Californium (98)	Cf 249	I
	Cf 250	I
	Cf 252	I
Carbon (6)	C 14	IV
Cerium (58)	Ce 141	IV
	Ce 143	IV
	Ce 144	III
Cesium (55)	Cs 131	IV
	Cs 134 m	III
	Cs 134	III
	Cs 136	IV
	Cs 137	III
Chlorine (17)	Cl 38	IV
	Cl 39	IV
Chromium (24)	Cr 51	IV
Cobalt (27)	Co 56	III
	Co 57	IV
	Co 58 m	IV
	Co 58	IV
	Co 60	III
Copper (29)	Cu 64	IV
Curium (96)	Cm 242	I
	Cm 243	I
	Cm 244	I
	Cm 245	I
	Cm 246	I
Dysprosium (66)	Dy 164	III
	Dy 165	IV
	Dy 166	IV
Erbium (68)	Er 169	IV
	Er 171	IV
Europium (63)	Eu 150	III
	Eu 152 m	IV
	Eu 152	III
	Eu 154	II
	Eu 155	IV
Fluorine (9)	F 18	IV
Gadolinium (64)	Gd 153	IV
	Gd 159	IV
Gallium (31)	Ga 67	III
	Ga 72	IV
Germanium (32)	Ge 71	IV
Gold (79)	Au 193	III
	Au 194	III
	Au 195	III
	Au 196	IV
	Au 198	IV
	Au 199	IV
Hafnium (72)	Hf 181	IV
Holmium (67)	Ho 166	IV
Hydrogen (1)	H 3 (see tritium)	IV
Indium (49)	In 113 m	IV
	In 114 m	III
	In 115 m	IV
	In 115	IV
Iodine (53)	I 124	III
	I 125	III
	I 126	III
	I 129	III
	I 131	IV
	I 132	III
	I 133	III
	I 134	IV
	I 135	IV
Iridium (77)	Ir 190	IV
	Ir 192	III
	Ir 194	IV
Iron (26)	Fe 55	IV
	Fe 59	IV
Krypton (36)	Kr 85 m (uncompressed)**	III
	Kr 85 (uncompressed)**	V
	Kr 85 (uncompressed)**	III
	Kr 85 (uncompressed)**	VI
	Kr 87 (uncompressed)**	II
	Kr 87 (uncompressed)**	V
Lanthanum (57)	La 140	IV
Lead (82)	Pb 203	IV
	Pb 210	II
	Pb 212	II
Lutetium (71)	Lu 172	III
	Lu 177	IV
Magnesium (12)	Mg 28	III
Manganese (25)	Mn 52	IV
	Mn 54	IV
	Mn 56	IV
Mercury (80)	Hg 197 m	IV
	Hg 197	IV
	Hg 203	II
Mixed fission products MFP		II

See footnotes at end of table.

APPENDIX C—TRANSPORT GROUPING OF RADIONUCLIDES—Continued

Element*	Radionuclide***	Group
Molybdenum (42)	Mo 99	IV
Neodymium (60)	Nd 147	IV
	Nd 149	IV
Neptunium (93)	Np 237	I
	Np 239	I
Nickel (28)	Ni 56	III
	Ni 69	IV
	Ni 63	IV
	Ni 65	IV
Niobium (41)	Nb 93 m.	IV
	Nb 95	IV
	Nb 97	IV
Osmium (76)	Os 185	IV
	Os 191 m.	IV
	Os 191	IV
	Os 193	IV
Palladium (46)	Pd 103	IV
	Pd 106	IV
Phosphorus (15)	P 32	IV
Platinum (78)	Pt 191	IV
	Pt 193	IV
	Pt 193 m.	IV
	Pt 197 m.	IV
	Pt 197	IV
Plutonium (94)	Pu 238 (F)	I
	Pu 239 (F)	I
	Pu 240	I
	Pu 241 (F)	I
	Pu 242	I
	Po 210	IV
Polonium (84)	K 42	IV
Potassium (19)	K 43	III
	K 44	IV
Praseodymium (59)	Pr 143	IV
Promethium (61)	Pm 147	IV
	Pm 149	IV
Protactinium (91)	Pa 230	I
	Pa 231	I
	Pa 233	II
Radium (88)	Ra 223	II
	Ra 224	II
	Ra 226	I
	Ra 228	I
Radon (86)	Rn 220	IV
	Rn 222	II
Rhenium (75)	Re 183 (F)	IV
	Re 186	IV
	Re 187	IV
	Re 188	IV
	Re Natural	IV
Rhodium (45)	Rh 103 m.	IV
	Rh 105	IV
Rubidium (37)	Rb 86	IV
	Rb 87	IV
	Rb Natural	IV
Ruthenium (44)	Ru 97	IV
	Ru 103	IV
	Ru 105	IV
	Ru 106	III
Samarium (62)	Sm 145	IV
	Sm 147	IV
	Sm 151	IV
	Sm 153	IV
Scandium (21)	Sc 46	III
	Sc 47	IV
	Sc 48	IV
Selenium (34)	Se 75	IV
Silicon (14)	Si 31	IV
Silver (47)	Ag 105	IV
	Ag 110 m.	III
	Ag 111	IV
Sodium (11)	Na 22	III
	Na 24	IV
Strontium (38)	Sr 85 m.	IV
	Sr 85	IV
	Sr 88	III
	Sr 90	II
	Sr 91	III
	Sr 92	IV
Sulphur (16)	S 35	IV
Tantalum (73)	Ta 182	III
Technetium (43)	Tc 96 m.	IV
	Tc 96	IV
	Tc 97 m.	IV
	Tc 97	IV
	Tc 99 m.	IV
	Tc 99	IV
	Tc 98	IV
Tellurium (52)	Te 125 m.	IV
	Te 127 m.	IV
	Te 127	IV
	Te 129 m.	III
	Te 129	IV
	Te 131 m.	III
	Te 132	IV
Terbium (65)	Tb 160	III
Thallium (81)	Tl 200	IV
	Tl 201	IV
	Tl 202	IV
	Tl 204	III
Thorium (90)	Th 227	II
	Th 228	I
	Th 230	I
	Th 231	I
	Th 232	III
	Th 234	II
	Th Natural	II

Element*	Radionuclide***	Group
Thallium (89)	Tm 168	III
	Tm 170	IV
	Tm 171	IV
Tin (50)	Sn 113	III
	Sn 117 m	III
	Sn 121	III
	Sn 125	IV
Tritium (1)	H 3	IV
	H 3 (as a gas, as luminous paint, or adsorbed on solid material). -----	VII
Tungsten (74)	W 181	IV
	W 185	IV
	W 187	IV
Uranium (92)	U 230	II
	U 232	I
	U 233 (F)	II
	U 234	II
	U 235 (F)	III
	U 236	II
	U 238	III
	U Natural	III
	U Enriched (F)	III
	U Depleted	III
Vanadium (23)	V 48	IV
	V 49	III
Xenon (54)	Xe 125	III
	Xe 131 m	III
	Xe 131 m (uncompressed). **	V
	Xe 133	III
	Xe 133 (uncompressed). **	VI
	Xe 135	II
	Xe 135 (uncompressed). **	V
Ytterbium (70)	Yb 175	IV
Yttrium (39)	Y 88	III
	Y 90	IV
	Y 91 m	III
	Y 91	III
	Y 92	IV
	Y 93	IV
Zinc (30)	Zn 65	IV
	Zn 69 m	IV
	Zn 69	IV
Zirconium (40)	Zr 93	IV
	Zr 95	III
	Zr 97	IV

*Atomic number shown in parentheses.
 ** Uncompressed means at a pressure not exceeding one atmosphere.
 *** Atomic weight shown after the radionuclide symbol.
 m—Metastable state.
 (F) Fissile material.

1. *Free Drop*—A free drop through a distance of 30 feet onto a flat essentially unyielding horizontal surface, striking the surface in such a position as to suffer maximum damage.
2. *Percussion*—Impact of the flat circular end of a 1 inch diameter steel rod weighing 3 pounds, dropped through a distance of 40 inches. The capsule or material shall be placed on a sheet of lead, of hardness number 3.5 to 4.5 on the Vickers scale, and not more than 1 inch thick, supported by a smooth essentially unyielding surface.
3. *Heating*—Heating in air to a temperature of 1,475° F. and remaining at that temperature for a period of 10 minutes.

4. *Immersion*—Immersion for 24 hours in water at room temperature. The water shall be at pH 6–pH 8, with a maximum conductivity of 10 micromhos per centimeter.

The record keeping and reporting requirements contained in this part have been approved by the Bureau of the Budget in accordance with the Federal Reports Act of 1942.

December 31, 1968

9900
Ser 38 - 0516
20 February 1969

FIRST ENDORSEMENT ON NRDL LETTER 730-496 ALS:kms OF 14 FEB 1969

From: Commander, Naval Electronic Systems Command
To: Chief
Source and Special Nuclear Materials Branch
Division of Materials Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subj: Special Nuclear Material License No. SNM-35

1. Basic letter with enclosure contains additional supplemental information relevant to questions raised during the evaluation of the application for renewal of subject license.
2. This material has been reviewed and pertains to the use of Special Nuclear Materials at the Laboratory which are authorized under AEC License No. SNM-35.

92/05/5 - mmm

Copy to:
NMEC(Code 74)
NRDL, SFRAN

C. S. HOLLANDER
By direction

MAHAFFEY/mitchell
61457 - 2/20/69
Serial 0218-194-69

U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY
SAN FRANCISCO, CALIFORNIA 94135

IN REPLY REFER TO:

730-496

ALS:kmm

14 FEB 1969

From: Commanding Officer
To: Chief, Source and Special Nuclear Materials Branch,
Division of Materials Licensing, U. S. Atomic Energy
Commission, Washington, D. C. 20545
Via: Commander, Naval Electronic Systems Command,
(Code 05163), Munitions Building, 18th & Constitution
Avenues, Washington, D. C. 20360

Subj: Special Nuclear Material License No. SNM-35

Ref: (a) USAEC ltr DML:LR 70-35 of 1 Nov 1968

Encl: (1) Supplemental Information Concerning Use of Special
Nuclear Materials at NRDL

1. As requested by reference (a), additional details relative to safeguards during the use of plutonium and other special nuclear materials at the Naval Radiological Defense Laboratory have been compiled and are submitted as enclosure (1).

A. L. WILEY, Jr.
By direction

Recd. on 2/19/69 & fwded to AEC
by 1st Encl, Ser 0516 38 of 20 February 1969

ACTION: 0516

INFO: ①

9900

0218 194-69

SUPPLEMENTAL INFORMATION CONCERNING USE OF SPECIAL NUCLEAR MATERIALS AT NRDL

1. Glovebox Supply - Exhaust System

Our glovebox system, manufactured by the Vacuum Atmosphere Corporation, is used for ^{239}Pu and ^{238}Pu in less than one gram quantities. This glovebox may be described as a once-through nitrogen atmosphere stainless steel box. The attached flow diagram shows the nitrogen flow routes through the box and filter system. It is noted that inside-the-box high efficiency filters are provided for nitrogen inlet and exhaust.

On the vacuum pump inlet we have installed a CWS #6 glass fiber high efficiency filter. The final filtration (MSA HIE 40 prefilter and SM-CU-72920 (XBXXX) fine filter) is located further downstream at the roof exhaust fan location.

During use the box pressure is maintained at 0.5 to 0.75 inches H_2O below room pressure. The pressure differential is maintained by the "Peditrol Unit" noted on the flow diagram. A magnahelic gauge provides visual indication of the pressure differential.

It is estimated that the exhaust system will provide an air flow rate through an open glove port of 0.67 liter per minute per square inch or a total flow of 33 liters per minute.

2. Glovebox Filtration System

The interior glovebox filters are model 2002583 filters manufactured by the Cambridge Filter Corporation. These are described by the company representative as the fire resistant type.

The vacuum pump prefilter is the MSA CWS #6 type with glass fiber filter media in a wood frame. The filter media will withstand temperatures to 1000°F although the wood frame is not fire resistant.

The final roof fan exhaust filter has similar fire resistant qualities to that of the CWS #6 filter.

The glovebox exhausts through three stages of filtration, the box internal filters, the vacuum pump inlet filter and the roof exhaust filter. In addition, the nitrogen make-up gas enters the box through high efficiency filters.

3. Plutonium Urinalysis Procedures

We have specified a minimum frequency of monthly urinalysis for personnel during work with plutonium in such form and quantity that the possibility of significant internal exposure can occur.

The method of urinalysis is shown in the attached excerpt from D R&D Technical Report USNRDL-TR-451, "Analytical Procedures at the U. S. Naval Radiological Defense Laboratory for the Determination of Certain Radioelements in Urine", by W. H. Shipman and H. V. Weiss. It is noted that recovery of the order of 90% is obtainable. The final electrodeposited disc is counted in a Beckman Widebeta I low background counter, which when set up for alpha counting, has a background of 0.03-0.05 c/m and will count alpha activity with an efficiency of 35%. One hundred minute counts are normally used -- the detection limit is of the order of 0.2 d/m, for this counting time. We use this detection limit as the level for follow-up sampling and evaluation.

4. Waste Disposal Practices

Plutonium wastes usually occur as mixtures of suspended and ionic plutonium in sea water. Since the solubility of plutonium in sea water is about 70 micrograms per liter, the waste solutions are filtered to remove the major portion of the plutonium. The filters used are packaged in 2R containers for disposal. The dissolved plutonium is, in large part, removed by passing the sea water through Chelex 100, an exchange resin with selective absorption for higher valent ions. The procedure does not involve nitrate-form anion exchange resins. Ion exchange normally reduces the sea water to the level where it can be solidified and disposed of as low specific activity material as defined by the Department of Transportation.

5. Respiratory Protective Equipment

No application is made for approval for the use of respiratory protective equipment to determine the exposure of individuals to airborne concentrations.

PLUTONIUM ANALYSIS

Plutonium is cocrystallized with potassium rhodizonate from urine. It is then purified from interfering substances by coprecipitation with lanthanum as fluoride and then hydroxide. Anion exchange separates plutonium from lanthanum and traces of iron. The purified plutonium is electrodeposited on tantalum and counted in a low background alpha proportional counter.

The average recovery of plutonium is $91.3 \pm 5.0 \%$.

REAGENTS AND EQUIPMENT

Potassium Rhodizonate - Crystals (Paul B. Elder Co., Bryan, Ohio).

Absolute Ethyl Alcohol - C_2H_5OH 100 %.

Concentrated Nitric Acid - HNO_3 70 %, sp. gr. 1.42.

Concentrated Hydrochloric Acid - HCl 36 %, sp. gr. 1.19.

Concentrated Sulfuric Acid - H_2SO_4 96 %, sp. gr. 1.84.

Concentrated Perchloric Acid - $HClO_4$ 70-72 %, sp. gr. 1.6.

Concentrated Hydrofluoric Acid - HF 49.1 %.

Concentrated Ammonium Hydroxide - NH_4OH 28 %, sp. gr. 0.90.

2N Nitric Acid - Add 128 ml of concentrated nitric acid (HNO_3 70 %, sp. gr. 1.42) to 500 ml of distilled water in a liter volumetric flask. Make up to volume with distilled water and mix.

1N Hydrochloric Acid - Place 87 ml of conc. hydrochloric acid (HCl 36 % sp. gr. 1.19) in a liter volumetric flask and dilute to volume with distilled water.

6N Hydrochloric Acid - Place 513 ml of conc. hydrochloric acid (HCl 36 % sp. gr. 1.19) in a liter volumetric flask and dilute to volume with distilled water.

9N Hydrochloric Acid - Place 770 ml of conc. hydrochloric acid (HCl 36 %, sp. gr. 1.19) in a liter volumetric flask and dilute to volume with distilled water.

5N Sodium Hydroxide - Dissolve 200 g of sodium hydroxide (NaOH-AR) in 500 ml of distilled water in a liter volumetric flask. Cool, dilute to 1 liter with distilled water, and mix. Store in a polyethylene bottle.

Saturated Boric Acid - Place 200 g of boric acid (H_3BO_3 -AR) in 500 ml distilled water. Heat to boiling and cool.

Sodium Chloride Solution - Dissolve 1.5 g sodium chloride (NaCl - AR) in 100 ml distilled water.

Sodium Nitrite Solution - Dissolve 2.6 g of sodium nitrite ($NaNO_2$ - AR) in 100 ml of distilled water.

Ammonium Chloride Solution - Place 320 g of ammonium chloride in (NH_4Cl -AR) in a liter volumetric flask, dissolve and dilute to volume with distilled water.

Lanthanum Carrier Solution - Dissolve 1.6 g of lanthanum nitrate ($La(NO_3)_3 \cdot 6H_2O$ -AR) in 100 ml of 2N nitric acid.

Eluting Solution - Place 513 ml of conc. hydrochloric acid (HCl 36 %, sp. gr. 1.19) and 7.4 ml conc. hydrofluoric acid (HF 49.1 %) in a polyethylene flask and dilute to one liter with distilled water.

Anion Resin Bed - Support a 4 X 0.62 cm bed of AG 1 X 8 (Cl^- : 0.297-0.144 mm.) (Bio-Rad Laboratories, Berkeley, Calif.) on teflon shavings in a teflon column. Wash the bed with 9N hydrochloric acid before use. (To regenerate the column after an analysis first wash with 15 ml 1N hydrochloric acid and then with 15 ml 9N hydrochloric acid). Flow rate for all solutions should be 1-2 ml/min.

Tantalum Discs - 7/8 inch diameter discs cut from tantalum cranial plates (Johnson and Johnson, N.J.). To clean, boil in benzene for several minutes.

Electrodeposition Cell - Serial No. BG 209-81-1 (Tracerlab, Richmond, Calif.).

Electroanalyzer - Sargent-Slomin (E.H. Sargent Co., Chicago, Illinois).

PROCEDURE

1. Add 1 g potassium rhodizonate to 500 ml of urine sample. (If urine is not fresh, solubilization of the reagent may be difficult. Under such circumstances acidification of the sample with hydrochloric acid to pH 2-3 effects rapid solution.) Adjust to pH 9 with 5N sodium hydroxide and crystallize the rhodizonate with 500 ml of absolute ethyl

alcohol. Let stand for several minutes and isolate the crystals by centrifugation.

2. Dissolve the crystals in 50 ml 2N nitric acid and place in 100 ml lusteroid tube. Add 1 ml lanthanum carrier and precipitate with 30 ml hydrofluoric acid. Centrifuge 3 minutes. Without separating liquid from precipitate, add 0.5 ml lanthanum carrier with stirring. Centrifuge 5 minutes. Discard supernatant liquid.

3. Dissolve the precipitate in 5 ml saturated boric acid and 5 ml conc. hydrochloric acid. Add about 10 ml distilled water and make alkaline with conc. ammonium hydroxide. Centrifuge 3 minutes. Without separating liquid from precipitate, add 0.5 ml lanthanum carrier with stirring. Centrifuge 5 minutes. Discard supernatant liquid.

4. Dissolve the precipitate in conc. nitric acid. Add about 15 ml of water and reprecipitate with conc. ammonium hydroxide. Centrifuge 3 minutes. Without separating liquid from precipitate, add 0.5 ml lanthanum carrier with stirring. Centrifuge 5 minutes. Discard supernatant liquid.

5. Dissolve the precipitate in conc. nitric acid. Add 3 ml conc. sulfuric acid and heat to dryness over an open flame.

6. Dissolve the salts in 15 ml 6N hydrochloric acid with the aid of heat. After cooling, add 0.5 ml sodium nitrite solution and 15 ml conc. hydrochloric acid. Let stand 5 minutes.

7. Pass this solution through the anion resin bed. Wash the column with 15 ml 9N hydrochloric acid.

8. Elute with 30 ml of the eluting solution. Collect eluate in teflon beaker which contains 1 ml of the sodium chloride solution. Evaporate to dryness.

9. Dissolve the salt in conc. nitric acid and transfer to a glass beaker. Add 2 ml conc. perchloric acid and 2 ml conc. sulfuric acid and heat to dryness.

10. Dissolve the white salt in 1 ml of water and transfer by micro-pipet to an electrodeposition cell fitted with a tantalum disc. Add 4 ml of the ammonium chloride solution and 2 drops of conc. hydrochloric acid to the cell.

11. Electrodeposit at 2.5 to 3.0 amp. for 20 minutes, and then add 1 ml of conc. ammonium hydroxide.

12. Wash solution from cell with distilled water and dry the tantalum disc on a hot plate.

13. Count in a low background alpha proportional counter.

CALCULATION

The results are calculated as d/m/24 hour urine sample.

$$\frac{\text{Sample c/m} - \text{Background c/m} \times \text{Volume 24 hour sample (ml)}}{\text{Counter Efficiency} \times 500} = \text{d/m/24 hour sample}$$

The counting efficiency for alpha proportional counters at NRDRL is taken as 50 %.

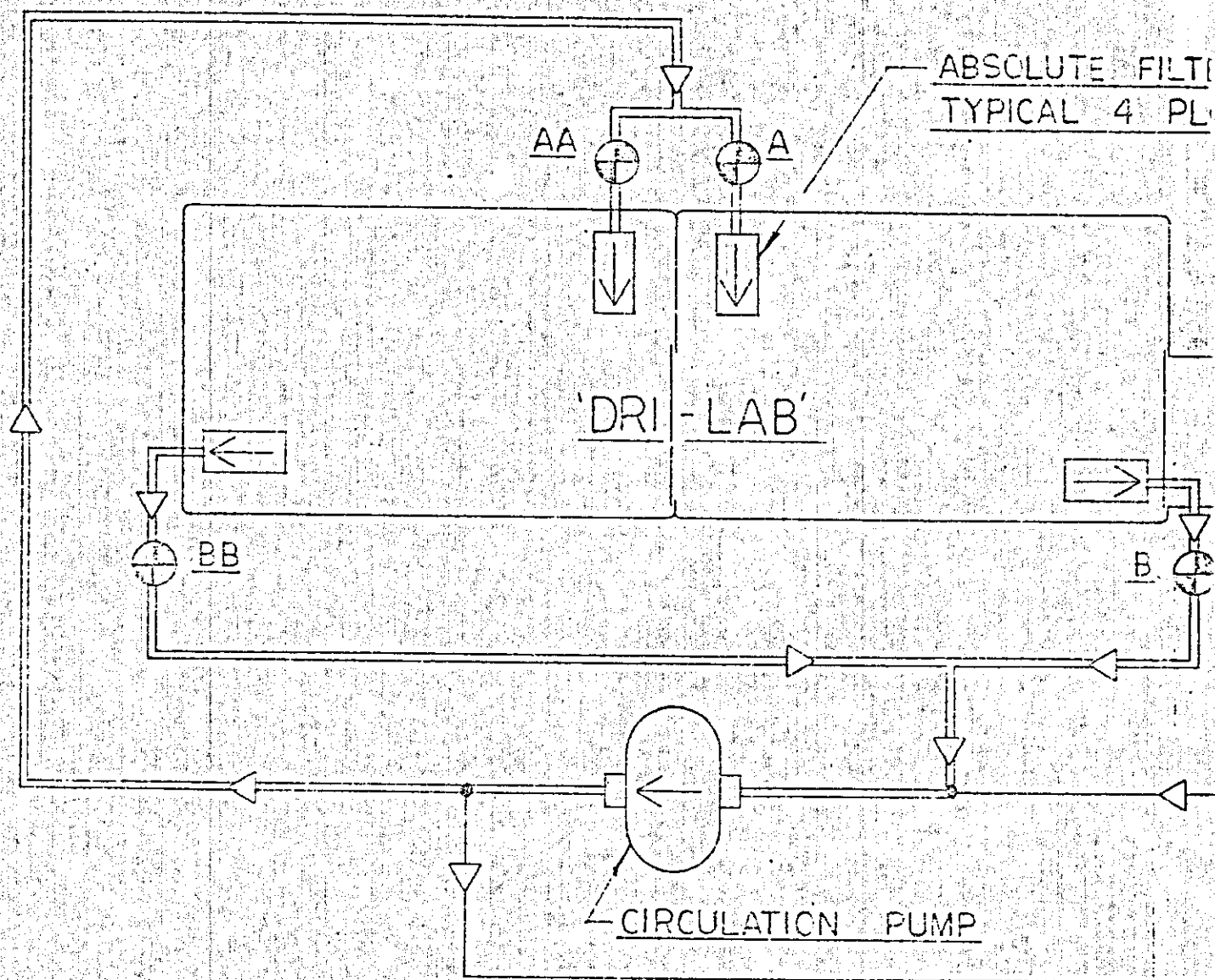
REFERENCE

H.V. Weiss, W.H. Shipman. The Determination of Plutonium in Urine. U.S. Naval Radiological Defense Laboratory Report, Technical Report in publication.

TABLE VIII.

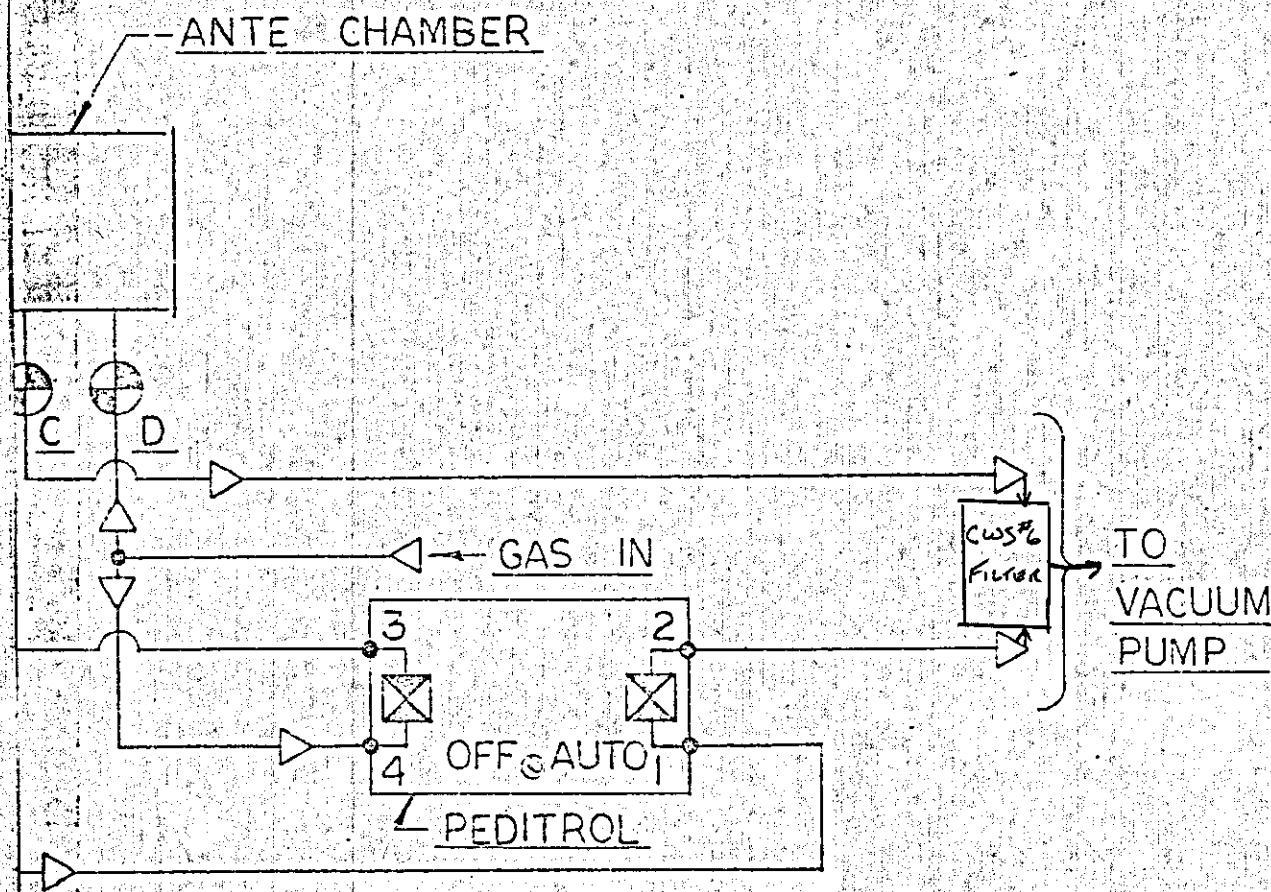
The Extent to Which Other Alpha Emitters
Follow the Plutonium Procedure

<u>Alpha Emitter</u>	<u>Recovery (%)</u>
Th ²³²	0.5
U ²³⁸	2.3
Pa ²³¹	24.1
U ²³⁷	85.2



LEDGEND

- == MAIN CIRCULATION LINES
- SECONDARY LINES
- FLOW DIRECTION
- ⊗ MANUAL VALVE
- ⊗ SOLENOID VALVE



PROPERTY OF VACUUM/ATMOSPHERES CORPORATION.
USE OF PATENTED FEATURES UNCLOSED ON THIS DWG.
PROHIBITED. USE OF THIS DWG. FOR COMPETITIVE
PROCUREMENT PROHIBITED.

VACUUM/ATMOSPHERES CORPORATION

LOS ANGELES, CALIFORNIA

UNLESS
OTHERWISE
SPECIFIED

0.00 = ± 0.00
0.000 = ± 0.010
0.001 = ± 0.002

COORD. WITH

DATE ASSY.

MODEL

DWG. AREA

SCALE

HE-113-55

1-1/2 SQ. FT.

NO SCALE

DES.

APP.

APP.

NAME

GARY

[Signature]

DATE

1-31-66

DRAWING NO.

SK-613

**FLOW DIAGRAM
FOR HE-113-55**

9900

Ser 157 - 0516

FIRST ENDORSEMENT ON NRDL LETTER 730-398 AK:kmm OF 25 JUNE 1968

MUL

1 1968

From: Commander, Naval Electronic Systems Command
To: Chief
Source and Special Nuclear Materials Branch
Division of Materials Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subj: AEC Special Nuclear Material License No. SNM-35

1. Basic letter with enclosure contains an application for renewal of subject license.
2. This material has been reviewed and includes updated information relevant to the Laboratory's current special nuclear material needs and methods of utilization.

80/11/5 - m m m

M. G. WILLIAMS
By direction

Copy to:
BUMED(Code 74)
NRDL, SFRAN

MAHAFFEY/mitchell
61457 - 7/1/68

U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY
SAN FRANCISCO, CALIFORNIA 94135

IN REPLY REFER TO:
730-398
AK:kmm

25 JUN 1968

AIRMAIL

From: Commanding Officer
To: Chief, Division of Materials Licensing, Source and Special
Nuclear Materials Branch, USAEC
Via: Commander, Naval Electronic Systems Command (Code
05163), Munitions Building, 18th & Constitution Avenues,
Washington, D. C. 20390

Subj: Renewal of AEC Special Nuclear Material License No.
SNM-35; request for

Encl: (1) Application for Renewal of AEC Special Nuclear Material
License No. SNM-35 (3 copies)

1. This Laboratory's application for renewal of Special Nuclear Material License No. SNM-35, enclosure (1) is submitted for review and approval. The material submitted in support of the application has been recently updated and represents current radioisotope needs and methods of utilization.
2. Any clarification or further information needed in support of this application will be supplied upon request.

D. C. CAMPBELL

Copy to:
BUMED (Code 74) (w/encl (1))

APPLICATION FOR RENEWAL OF SNM-35

I. GENERAL INFORMATION

A. Introduction

The U. S. Naval Radiological Defense Laboratory (USNRDL) is located in the San Francisco Bay Naval Shipyard, Hunters Point Site (Building 815), San Francisco, California 94135. Facilities are located at other Buildings in the Shipyard area. It also has facilities at Camp Parks, a deactivated Army Base near Pleasanton, California and at San Clemente Island, located approximately 50 miles off the Coast of Southern California (between Long Beach and San Diego). All Special Nuclear Materials will be possessed and used by the U.S. Naval Radiological Defense Laboratory and may also be used at Navy, Army and Air Force Facilities provided such use is under the direct supervision and control of the U. S. Naval Radiological Defense Laboratory personnel and in accordance with procedures established by the Radiological Safety Committee of the U. S. Naval Radiological Defense Laboratory. It may be sent out to other Atomic Agency Commission or Agreement State Licensed Activities.

B. Types and Quantities of Special Nuclear Material

The Special Nuclear Material will be possessed and used as follows: (1) Pu-238 Be Sealed Neutron Sources -- 20 grams. When Pu-238 is made available by the U. S. Atomic Energy Commission, these sources will be fabricated by the Monsanto Research Corporation, Dayton, Ohio, in accordance with the specifications listed in Appendix A.

(2) Pu-238 -- 55 grams. Any chemical or physical form. Milligram quantities will be used to study the chemical and physical characteristics of Plutonium and as target material in reactor and/or particle accelerator irradiations at AEC Licensed Activities. Gram amounts will be used to determine solubility rates of alloys of plutonium with other elements. In particular, the ROVER/NERVA program "Radionuclides Released to Sea Water from Nuclear Powered Sources" and the Space Electronic Power Office program "Marine Environment Test Station" are examples of such studies.

(3) Pu-239 -- 2000 grams. Any chemical or physical form. (Note: 1018.054 grams in sealed PuBe/PuF₄ neutron sources presently on hand.

PuBe sealed sources range from one gram to eighty (1-80) grams each. PuF₄ sealed neutron source is 760 grams).

Gram quantities will be used to study the chemical and physical characteristics of plutonium and as target material in reactor and/or particle accelerator irradiations at AEC Licensed Activities. In particular, the ROVER/NERVA program "Radionuclides Released to Sea Water from Nuclear Powered Sources" is an example of such a study. As sealed sources producing neutrons for animal irradiation studies and for biological effects of these materials in living animals. In alpha-neutron reaction sealed sources for neutron production.

(4) U-235 -- 1000 grams. Any chemical or physical form. Gram quantities will be used to study the chemical and physical characteristics of Uranium and as target material in reactor and/or particle accelerator irradiations at AEC Licensed Activities. The ROVER/NERVA program "Radionuclides Released to Sea Water from Nuclear Powered Sources" and the Space Nuclear Propulsion Office, radiological effects program are examples of such studies. Gram quantities will be used in foil form for neutron dosimeters.

(5) U-233 -- 30 grams. Any chemical or physical form. Milligram quantities will be used to study the chemical and physical characteristics of Uranium and as target material in reactor and/or particle accelerator irradiations at AEC Licensed Activities.

Plutonium-Beryllium neutron sources are stored, when not in use, in their original shipping containers. The 80 gram Pu-Be sealed source capsule and the shipping/storage container are shown in Appendix A-1. Dose rates at the surface of these containers are of the order of 40 mrem/hr. The 760 gram Pu-Be container is a similar paraffin-filled container with a dose rate of 30 mrem/hr at the surface.

The sources are used for calibration purposes. As fast neutron sources, they are used in a free air, 4π configuration. As thermal neutron sources, they are used in a moderating media typically shown in NRDL Drawing No. NU-58-496, Slow Neutron Flux Generator, (Appendix A-2). Surface dose rates are of the order of 40 mrem/hr. The maximum neutron emission from any individual source is 1×10^7 n/sec.

The use of special nuclear material as target materials is confined to the exposure to neutron fluxes by reactors and accelerators. As reactor irradiation samples, the special nuclear materials are encapsulated

in quartz capsules which are in turn encapsulated in aluminum capsules. Typical aluminum capsules are shown in Appendices A-3, A-4 and A-5. The capsules are leak tested by Reactor personnel before irradiation.

As cyclotron neutron targets, the special nuclear materials consist of metal foils or solution evaporated onto mylar film, doubly wrapped in polyethylene film. The materials are exposed to neutron by placement near the accelerator neutron-producing target.

C. Administrative Controls

Special nuclear materials will be used under the supervision and control of the U. S. Naval Radiological Defense Laboratory personnel in accordance with procedures established by the Radiological Safety Committee of NRDL. The members and qualifications of the Radiological Safety Committee are as follows:

(1) Dr. Edward R. Tompkins, Chairman.

Chairman, Radiological Safety Committee, NRDL, November 1962 to date; Associate Scientific Director, NRDL, November 1961 to date; Scientific Liaison Officer, ONR, London, England, July 1960 - October 1961; Head, Chemical Technology Division, NRDL, December 1951-June 1960; Consultant, NRDL, five (5) months-1951; Consultant, U. C. Radiation Laboratory, Berkeley, California -16 months; Assistant Manager and Director of Research for Scientific Service, Inc., Berkeley, California - 18 months; Radiochemist, Atomic Energy Commission, Advisory Field Service, Oak Ridge, Tennessee - six (6) months; Supervisor, Chemistry Department, Clinton Laboratory, Oak Ridge, Tennessee - four (4) years; Research Chemist, Armour Research Foundation, Chicago, Illinois, one (1) year.

(2) Albert L. Smith, Alternate Chairman.

Head, Health Physics Division, NRDL, February 1962 to date; Head, Radiological Safety Branch, Health Physics Division, NRDL, July 1956-February 1962; Health Physicist, NRDL, October 1951- July 1956; Health Physicist, General Electric Corporation, Hanford Atomic Products Operation, January 1948-October 1951.

(3) Dr. Thomas R. Birdwell, LCDR, MC, USN, Alternate Chairman.
Head, Medical Department, NRDL, July 1967 to date. Research

Pathologist, Biological and Medical Sciences Division, NRDL, 1966-1967; Pathology Resident, Department of Pathology, U. S. Naval Hospital, San Diego, California, 1962-1966; Internship, U. S. Naval Hospital, Camp Pendleton, California, 1961-1962; M.D., Tulane University Medical School, 1961.

(4) Dr. Edward L. Alpen.

Head, Biological and Medical Sciences Division, NRDL, April 1959 to date; Head, Biophysics Branch, NRDL, 1956-April 1959; Head, Thermal Injury Branch, NRDL 1952-1956; Investigator in Thermal Injury Branch, NRDL, April 1951-September 1952; Assistant Professor Pharmacology, George Washington University, Washington, D. C., January 1950-April 1951.

(5) Dr. William E. Kreger.

Head, Physical Sciences Division, NRDL, November 1966 to date; Head, Cyclotron Project, NRDL, July 1966-November 1966; Head, Nucleonics Division, October 1962-July 1966; Acting Head, Nucleonics Division, NRDL, 1961-1962; Head, Nuclear Radiation Physics Branch, NRDL, 1958-1961; Senior Investigator (Nuclear Physicist), Shielding Section, NRDL, 1952-1958.

(6) Dr. Richard Cole.

Head, Chemical Technology Division, NRDL, September 1964 to date; Head, Countermeasures Evaluation Branch, Military Evaluations Division, May 1959-September 1964; Radiological Chemist, Military Evaluations Division, December 1956-May 1959; Radiological Chemist, Chemical Technology Division, March 1952-December 1956.

The responsibilities of the Health Physics Division include the control and accountability of all radioisotopes including special nuclear materials used in the Laboratory. The control procedures require the use of specific forms.

Individual use-approval forms called "Radioisotope Use Approval" 12ND NRDL-44 (Appendix B) and "Modification of Radioisotope Use Approval" 12ND NRDL-44A (Appendix C) are initiated by each experimenter when a particular special nuclear material is required. This experimental plan is reviewed by the investigator's Division Radiological Safety Committeeman who has supervisory cognizance over the experimental

program. When he has approved the completed form, it is submitted for review to the Health Physics Division. The Health Physics Division investigates the request and recommends safety requirements for the particular experimental setup on 12ND NRDL-76 "Radioisotope Use Investigation" (Appendix D). The NRDL-76 is then submitted with the completed NRDL-44 or 44A to the Chairman of the Radiological Safety Committee for review and final approval. A purchase order and procurement of the radioisotope is then processed after final approval is granted.

Records are maintained showing the identity, quantity and location and disposition of all special nuclear material (Appendix E). This record is maintained permanently. A "Radioisotope Order, Receipt and Transfer Log" is also maintained.

General administration instructions in Laboratory radiological Safety precautions are outlined in NRDLINST P5100.11 "U.S. Naval Radiological Defense Laboratory Radiological Safety Manual" (Appendix F).

D. Health and Safety Measures

In addition to the Laboratory's existing general health and safety measures and radiological safety procedures (Appendix F) operations involving use of SNM are conducted under Health Physics surveillance in designated Laboratory spaces. Dry boxes and/or ventilated hoods with filtered air exhaust are used. Personnel will utilize appropriate personnel covering and respiratory protection. Continual air sampling and monitoring of working spaces and personnel are conducted during the operations. No personnel will be allowed to leave the working area without being completely monitored and protective clothing removed. Monitoring survey and wipe smears of the working spaces and equipment are conducted after the completion of the operation. Specially marked liquid and solid waste containers (Appendix G "SNM Liquid Rad-Waste Container" and Appendix H "SNM Dry Rad-Waste Container") are provided for disposal of SNM contaminated waste and are removed from the spaces at frequent intervals and taken to an isolated storage area. Special nuclear material is stored in a locked space. Frequent radioanalysis of urine will be made during the operation. If there is any evidence of a high concentration of activity in the air, urine collection will be started at once for radioanalysis to detect any possible internal SNM contamination.

All shipments of radioactive material are delivered, unopened, to the Health Physics Division where Health Physicist, or technical personnel

under their supervision, open the package. In each instance, they conduct a radiological survey, perform any necessary decontamination, and determine the activity content of the material.

Incoming shipments of unencapsulated plutonium are unpackaged in a filtered fume hood with monitoring for surface alpha activity at each stage of the unpackaging. The innermost container is stored until the plutonium is needed in the experimental program. When the plutonium is required the container is opened in a dry box. The quantity needed is removed for use, and the remainder resealed in its container. Surface contamination and/or air monitoring accompanies this operation and all experimental use. Inert atmosphere may be used in dry box, if deemed necessary.

The use of unencapsulated special nuclear materials is evaluated before use by the Health Physics Division. Those quantities and uses wherein the possibility of airborne contamination exists are consigned to dry boxes or fume hoods. During the experiment, the dry boxes or fume hoods are continuously sampled at the point of exhaust by in-line filters operated at a flow rate of 2 c.f.m. Room air is continuously sampled by open-face 2 c.f.m. and/or 35 c.f.m. (Staplex) samples. MSA type 1106B or Millipore filter papers are used in filter media. Exhaust filters are changed twice weekly, room filters daily or more frequently as required for control purposes. Sensitivity of 3×10^{-14} uc/ml is readily attained.

Special nuclear materials when not in use will be stored in NRDL's isotope vault, an 18' x 36' room equipped with high-efficiency air exhaust filtration and radiation-isolated from the remainder of the Laboratory by 24" of concrete wall shielding. This vault is locked, with key control by Health Physics Division personnel. The vault plan is shown in Drawing S-53-543 (Appendix H-1).

The 250 gram unit will serve as the unit of isolation within this room. The one exception will be our 760 gram Pu-F₄ source, which in itself has been determined to be nuclear safe. This source and all other Pu-Be sources will be stored in their original shipping container within the room. The inherent size of these containers provides a greater than 12" center-to-center spacing.

A heavy-walled, fire resistant slide drawer safe will be used for storage of miscellaneous small quantities of materials, foils, solutions, pellets, etc. The top limit for this safe will be 250 grams total special nuclear material. To avoid non-nuclear accidents in storage and experimental areas, the following measures are taken:

Personnel are indoctrinated in safety and good housekeeping practices for Laboratory operations by their immediate supervisors. Work spaces are grouped together away from unprotected areas such as the library, auditorium, and secretarial offices. Volatile and combustibles are stored away from nuclear materials. Laboratory Buildings are inspected daily by the Guard Force and Safety Officer who are instructed to look for fire hazards and report them for remedial action. The San Francisco Bay Naval Shipyard Fire Department officials regularly examine NRDL fire-fighting facilities and make additional recommendations. Off-hours inspections are made at frequent intervals by the Guard Force and the Laboratory Duty Officer to insure plant safety.

E. Personnel Monitoring Devices and Procedures

The standard film badge dosimeter used at NRDL has five (5) filters of thickness 0.032" aluminum, 0.027" lead, 0.015" cadmium, and 0.010" paper and 0.125" plastic. It can be calibrated so as to give effective energy information as well as dosage information. The film used is a two-film packet, containing DuPont 555 and 1290 film, and can measure gamma exposures from 25 mr to about 2500 r.

The DuPont 555 and 1290 films are calibrated for response to beta radiation with a normal uranium plaque, and for response to gamma radiation with a cobalt-60 source, and various energies of X-ray, using NBS-certified thimble chambers as a standard. All calibration exposures are made with the film inside the badge.

Neutron film badges (NTA film) are also used when neutron sources are handled, or when personnel are in proximity to nuclear reactors or neutron producing particle accelerators. A neutron film badge service is supplied by a commercial firm (Radiation Detection Company, Mt. View, California).

Finger ring film badges (beta-gamma) are used whenever there is the possibility of hand exposure in excess of that measured by the body badge. A finger ring service is supplied by a commercial firm (Radiation Detection Company, Mt. View, California).

F. Ventilation Control

All spaces where radioactive material is employed are ventilated. The system is basically as follows:

Each floor has its own air intake and exhaust systems. Air is drawn in at each floor level and then exhausted to the roof through separate ducts. Thin fiberglass filters are used on the intake air, which also is cooled or heated as necessary. Exhaust air is filtered in only those spaces having hoods. Two commercial types of fiberglass filters are employed for this purpose. One is a throw-away type, while the other has a higher capacity and is used for low level radioactive exhausts. All filters are changed as performance requires.

The criteria used here for hood design was that no sizeable amount of radioactivity was to be employed in the hoods, but special containment systems such as glove boxes would be used instead. One hood, however, was outfitted with a separate extra high capacity filtered exhaust system in our radioisotope storage room. This hood is available for work where airborne contamination may be a problem. The face velocity of all hoods was set at 100-125 linear feet per minute.

For failures within the supply system, i.e., fan breakdown, etc., there is a provision for switching from one fan to another. In case of a power failure, after a period of nine (9) seconds, emergency power is supplied to the exhaust fans only. It is estimated, under these conditions that about 30% of normal supply air is drawn into the building through the supply system ducts, though the supply fans are off.

G. Accident Control

To control accidents, all glove boxes are outfitted with dry powder and/or liquid chemical fire extinguishers. In addition, CO₂ and H₂O fire extinguishers are dispersed throughout the building. There is an automatic sprinkler system and firehose station. The firehose stations are staffed with designated occupants on each floor for emergency fire fighting.

The Laboratory is evacuated in event of fire by public address system. Personnel required for duties associated with combating fire remain in the building. The local Fire Department of the San Francisco Bay Naval Shipyard has been provided with information as to Laboratory layout. Familiarization fire drills are carried out from time to time.

H. Environmental Control

In order to assure that adequate safety procedures are being followed in experiments with special nuclear material, the initial use

is checked by Health Physics. In addition, areas where special nuclear material is stored are routinely surveyed.

The monitoring consists of surveys for radiation and contamination levels with portable radiation detection instruments and by wipes of several areas in the space for evidence of removable activity. Air sampling is also conducted if there is a possibility of aerosol contamination. Any potentially serious conditions is called to the attention of the scientific investigator for corrective action.

An overall surveillance of the Laboratory radiological situation is maintained by a Environmental Monitoring Program. Air samples are collected continuously at the extremities of the Laboratory, as well as within the Chemistry Division's hood exhaust system. The samples from the Chemistry Division are monitored as they are collected and will cause a warning system to alarm if above safe operating levels occur. The air samples collected at the Laboratory extremities are changed bi-weekly and decay counted for radioactive aerosol concentration.

Film badges are placed throughout Laboratory spaces to detect any hazardous radiation levels. These are processed on a scheduled basis.

All Laboratory liquid effluent (except sanitary drains) is held in storage tanks and analyzed on a routine basis. The radioactivity concentration must be below maximum permissible concentrations prior to release to sewage system. Reports of all surveys are recorded and maintained in Health Physics files.

I. Respiratory Protection

The following respiratory protection devices are in use at the U. S. Naval Radiological Defense Laboratory:

(1) Mark Five face mask (standard Navy issue), a molded rubber face-fitting mask, with adjustable straps, plastic eyepiece, with two (2) filters of CC-6 cellulose-asbestos paper, 99.98%* efficient for 0.7 micron (medium size) methylene blue particles.

(2) M9A1 face mask (standard Army issue) a molded rubber face-fitting mask, with adjustable straps, plastic eyepiece, with attached

* Industrial Dust, by Drinker and Hatch.

canister filter cartridge of CC-6 cellulose — asbestos paper, 99.98%* efficient for 0.7 micron particles of medium size methylene blue.

(3) Mask, Protective, Field, M17, molded rubber face-fitting mask, with adjustable straps, two (2) optically clear plastic lenses with two (2) filter elements each consisting of two (2) layers of mineral fiber and charcoal.

(4) MSA Comfo Respirator with type "H" ultra filter elements.

(5) Synder protective suit with air supply system.

(6) Scott Air Paks.

Respirators are fitted to the face by the adjustment of flexible straps, drawing the soft rubber material snugly against the sides of the head. Fit is tested by blocking air passage through the filter and ascertaining that no air can be drawn into the mask past the fitted head part or the flutter valve exhaust port. Maintenance includes inspection for worn parts and their replacement. Filters which are found to contain any radioactivity when monitored are replaced. Respirators are issued on an individual basis and the rubber parts are periodically cleaned by alcohol swabs. All masks are thoroughly cleaned with alcohol before being reissued to other individuals. Indoctrination in using these devices is given to anybody unfamiliar with them. The use and testing of these devices is supervised by Health Physics personnel until the individual is completely familiar with the device and its operation.

J. Monitoring Devices

Monitoring devices available at the U. S. Naval Radiological Defense Laboratory include the following:

* Industrial Dust, by Drinker and Hatch.

<u>Instrument</u>	<u>Type</u>	<u>Qty on Hand</u>	<u>Range</u>	<u>Purpose</u>
Victoreen Vamp Model 808A	End Window GM	1	0-50 mr/hr	β - γ continuous area monitoring alarm system
Berkeley 2750	Side Window GM	27	0-50,000 c/m	β - γ dose rate and contamination monitoring
Eberline E112B	Side Window GM	6	0-20 mr/hr	β - γ dose rate and contamination monitoring
Nuclear 1615B	End Window GM	3	0-50,000 c/m	β - γ dose rate and contamination monitoring
AN/PDR 27	End Window GM Enclosed GM	67	0-5 mr/hr 0-500 mr/hr	β - γ dose rate and contamination monitoring
El-Tronics CP3D (Cutie Pie)	Ionization Chamber	13	0-10 rad/hr	β - γ dose rate monitoring
CP3DM (Cutie Pie)	Ionization Chamber	25	0-10 rad/hr	β - γ dose rate monitoring
CP3DMS (Cutie Pie)	Ionization Chamber	10	0-100 rad/hr	β - γ dose rate monitoring
AN/PDR-TIB	Ionization Chamber	18	0-50 r/hr	β - γ dose rate monitoring
Keleket K-240	Five Fold (GM)	1	10^4 Counts	β - γ hand and foot counter
Austin, Model 4	Five Fold (GM)	2	10^4 Counts	β - γ hand and foot counter
IM-113 A/PDR	Side Window GM	26	0-20 mr/hr	β - γ dose rate and contamination monitoring
Juno No. 3	Ionization Chamber	5	0-5000 mr/hr	α , β and γ dose rate and contamination monitoring
Berkeley 2750 (Modified)	End Window GM (with thin window)	2	0-50,000 c/m	Low energy beta monitoring
Eberline (PAC 3G)	Gas proportional	12	0-100,000 c/m	α contamination monitoring
Eberline PAC ISA	Scintillator	8	0-2,000,000 c/m	α contamination monitoring

<u>Instrument</u>	<u>Type</u>	<u>Qty on Hand</u>	<u>Range</u>	<u>Purpose</u>
AN/PDR-49A	BF ₃ proportional counter	3	2.5 x 10 ⁴ n/cm ² /sec slow or fast	neutron dose rate monitoring
AN/PDR-47	Proton recoil proportional counter	3	0-500 mrep/hr fast	fast neutron dose rate monitoring
Nuclear Model 2111 (Pee Wee)	BF ₃ proportional counter	1	10 ² /n/cm ² /sec fast 10 ³ /n/cm ² /sec slow	neutron dose rate monitoring
Ludlum Model 11 (with Bonner spheres)	Scintillation	1	0-50,000 cpm	fast neutron detection and energy determination
NRDL Tritium Meter	Ionization Chamber	1	10 ⁻³ µc/cc sensitivity	Tritium air contamination monitoring
T-289 Tritium Detector	Ionization Chamber	3	10 ⁻⁵ µc/cc sensitivity	Tritium air contamination monitoring
T-290 Tritium Detector	Ionization Chamber	2	10 ⁻³ µc/cc sensitivity	Tritium air contamination monitoring
Dosimeters IM-9E/PD	Direct reading pocket chamber	73	0-200 mr	γ personnel dosimetry
Dosimeter, Bendix Model 866	Direct reading pocket chamber	19	0-1 R	γ personnel dosimetry
Dosimeter, Bendix Model 611	Direct reading pocket chamber	25	0-5 R	γ personnel dosimetry
Dosimeter IM-19B/PD	Direct reading pocket chamber	25	0-10 R	γ personnel dosimetry
Dosimeter, Landsverk with adjustable finger ring	Indirect reading pocket chamber	10	0-2 R	γ personnel hand dosimetry
Reader-Charger Landsverk	Electrometer	1	--	Reading and charging indirect reading pocket chamber

<u>Instrument</u>	<u>Type</u>	<u>Qty on Hand</u>	<u>Range</u>	<u>Purpose</u>
Film Badge	DuPont 555 & 1290 5 filter film holder	7200	25 mr to about 2500 r	β - γ personnel dosimetry
Film Badge	Eastman NTA film	100	20 mrem to 10,000 mrem	Fast neutron personnel dosimetry
Film Badge finger ring	DuPont 508 & 1290	200	25 mr to about 2500 r	β - γ personnel hand dosi- metry
Staplex, high volume	Air Sampler	16	25 cfm	α , β - γ aerosol sample collection
Schmidt, low volume	Air Sampler	10	1.75 cfm	α , β - γ aerosol sample collection
Port-A-Vac	Air Sampler	5	6×10^5 cc/min	α , β - γ aerosol sample collection
Nuclear-Chicago Model 151A with scaler interchangeable end window GM & side window GM	GM Counter	1	--	β - γ air, water and wipe sample counting
Baird-Atomic Model 132 Scaler with end window GM	GM Counter	1	--	β - γ air, water and wipe sample counting
Baird-Atomic Model 135 Scaler with end window GM	GM Counter	1	--	β - γ air, water and wipe sample counting
Hamner Scaler with scintillation counter	Scintillation Counter	1	--	α air, water and wipe sample counting

<u>Instrument</u>	<u>Type</u>	<u>Qty on Hand</u>	<u>Purpose</u>
Nuclear-Chicago Scaler Model 202, with interchangeable alpha and beta scintillation counter	Scintillation Counter	1	α , β air, water and wipe sample counting
RCL and Systron Model 1091-3 Channel Spectrometer with 4" x 4" sodium iodide thallium activated crystal (256 Channel)	Scintillation Counter	1	γ air, water and wipe sample counting and isotope identification
Nuclear-Chicago Model 186A Scaler with gas proportional counter	Gas proportional	1	α , beta and low energy beta air, water and wipe sample counting.

K. Handling and Storage Equipment

Handling and storage equipment available at NRDL includes the following:

- (1) Twelve shipping containers, lead-shielding thickness ranging from 2" to 11".
- (2) 100 storage containers, 1" lead.
- (3) 32 storage containers, 2" lead.
- (4) 28 storage containers, 3" lead.
- (5) One concrete-shielded storage vault for isotope storage containers.
- (6) One concrete-shielded storage vault for radiation sources.
- (7) Fenced-storage areas for contaminated equipment waste storage.
- (8) Twenty remote pipettes for isotope solution transfers.

be liquids or solids, however, it is possible that gaseous wastes may be present. Generally, the waste materials will be as follows:

(1) Low level wastes as defined above will generally be of the nature of paper, wood, protective clothing, etc., used to protect the laboratory and personnel from contamination. Levels of special nuclear materials contained in these waste materials would normally be expected to be low enough that the material could be discarded as uncontaminated waste, however, in order to avoid the uncontrolled release of any amount of special nuclear materials, all of these types of materials will be packaged and treated as though they were contaminated.

An additional type of waste material that should normally be low level will be the apparatus used in the experimental procedures. In most cases the bulk of the apparatus would have, only, low level contamination. Certain items (e.g., reaction vessel or a 2000 ml beaker, etc.) would be expected to have "all" of the special nuclear materials and would be discarded as "high level" wastes. Therefore, since most, if not all of the special nuclear materials are contained in the "chemical reaction vessel" the other items can be discarded as low level wastes.

(2) High level wastes will be any item containing more than 100 microcuries of any or all three of the special nuclear materials in any possible combination. Waste materials will normally be solids, although it is remotely possible that a gaseous waste might be present. Items are likely to be metal turnings and chips, residues in chemical reaction vessels, etc. Liquids containing Pu-239 in any amount in excess of 100 microcuries is to be solidified using procedures outlined below under the "Waste Packaging Method" section.

M. Waste Packaging Methods

In general, the waste packaging methods are designed to satisfy the requirements for the most restrictive material (i.e., Pu-239). All proposed experimental procedures using any of the special nuclear materials must be approved by the Radiological Safety Committee as outlined previously under General Information (paragraph I.C.). In addition, any special waste handling requirements (e.g., solidifications of liquid wastes containing over 100 microcuries of Pu-239) are covered in the NRDL Form 76 "Isotope Procurement Investigation" (Appendix D).

Waste containers (point of origin). The standard NRDL waste containers (as described below) will be used for collection of any amount of Special Nuclear Materials up to 100 microcuries; amounts over 100 microcuries will be collected directly in the Department of Transportation (DOT) Specification 2R container (Appendix I) that will be used for eventual disposal. Certain exceptions to the collection of high level wastes directly into the DOT Specification 2R container may be directed by experimental considerations. Exceptions will be handled on a case basis and cannot be accurately predicted herein.

Liquid wastes containing less than 100 microcuries of Pu-239 per container will be solidified by the addition of an absorbent material such as Bentonite clay, etc. Low level liquid wastes containing only uranium will generally contain fission products or byproduct materials and will be handled on the basis of the β -gamma requirements. It is not anticipated that uranium and plutonium will ever be mixed in one container.

A general procedure has been developed whereby plutonium is removed from solution by absorption on a suitable ion exchange medium. The ion exchange material is contained in a column of such size and shape as to fit directly in a DOT Specification 2R container when loaded with plutonium. The concentration of plutonium in the liquid is reduced to approximately 100 dpm per cubic centimeter (as determined by liquid scintillation counting, using well documented methods). The liquids are then solidified by absorption into an inert material in amounts of five gallons or less. Under these conditions, the largest amount of plutonium likely to be contained in any container would be less than 10 microcuries. As an added precaution, these small containers of solidified wastes are enclosed in metal drums similar to a DOT Specification 37A prior to being placed in the shipping crate.

Waste containers (types). Two types of standard waste containers are in use at NRDL:

(a) The liquid waste container consists of a heavy wall polyethylene screw cap jug within a standard five gallon steel bucket. The jug and cap are natural virgin polyethylene. Metal buckets are painted magenta and the standard radiation symbol (three bladed propeller) and the words "CAUTION RADIOACTIVE MATERIAL" and "SPECIAL NUCLEAR MATERIAL LIQUID WASTES", and the upper limit of special nuclear material permitted in the container are painted in yellow over the magenta base color (Appendix G).

(b) The solid waste container is a standard fiber drum (approximately 16" deep by 30" high) lined with a polyethylene bag sufficiently large to completely line the inside of the drum. The drum is painted magenta and bears the standard radiation symbol and the words "Caution Radioactive Material" and "Special Nuclear Material Solid Wastes" (Appendix H).

(1) Waste Transportation. Special Nuclear Material wastes are to be transported from the point of origin to the waste packaging area (Triangle Area, Building 707 Compound) by Plant Support Branch personnel under the supervision of the Health Physics Division personnel. All waste transfers will be made by pickup truck with the bed of the truck protected by at least a single layer of standard barrier paper. Waste will be moved to the waste packaging area without en-route delays.

(2) Shipping Crates. All special nuclear material wastes will be packaged for disposal in a strong, tight, wooden crate as detailed in NRDL Drawing 246C-769, (Appendix J). Amounts of special nuclear material in excess of 100 microcuries will be encapsulated in DOT specification 2R containers prior to inclusion in the wooden crate.

A separate special nuclear materials balance will be established for the Waste Handling Area to insure that the total amount of special nuclear material present at any time will not exceed one unit (250 grams).

In order to avoid the requirement for special shielding including neutron absorbing lining materials for these crates, the total amount of special nuclear materials, in any combination of Pu-239, U-233, or U-235 which will be placed in one crate is 100 grams.

The crate will be marked with the standard radiation symbol and the words "CAUTION RADIOACTIVE MATERIAL" and "SPECIAL NUCLEAR MATERIAL WASTES", in addition to this, the mass and nature of the material will be marked on the crate.

(3) Shipment of Waste. As soon as conveniently possible after packing has been completed, each crate will be shipped for disposal. Disposal will normally be to any Atomic Energy Commission licensed commercial waste disposal contractor. In addition to the above stated maximum packing limit of 100 grams of material, the following conditions will be observed:

- (9) Two sets of master-slave manipulators.
- (10) Two concrete-walled hot cells.
- (11) Four lead-shielded glove boxes.
- (12) Twelve glove boxes, unshielded.
- (13) One 2-chambered, stainless steel glove box with negative pressure, argon atmosphere and recirculating exhaust filters.
- (14) Miscellaneous remote-handling tongs.
- (15) Sixteen radiobiological laboratories with 43 fume hoods.
- (16) Twenty-three radiochemical laboratories with 43 fume hoods.
- (17) Three radiophysics laboratories with 3 fume hoods.
- (18) One mobile radiological safety protective equipment supply station.

I. Waste Handling Procedures

Waste defined. The term "waste material:" as used herein will be limited to those special nuclear materials which will have no further use within any or all laboratory work spaces. Waste materials will be divided into two broad categories, namely,

(1) **Low level wastes.** All waste materials having less than 100 microcuries of Pu-239 (approximately 1.6 mg), 100 microcuries of U-233 (approximately 10.5 mg) or 100 microcuries of U-235 (approximately 4.65 gm) will be defined as low level wastes and will be packed for disposal as outlined below under the "Waste Packaging Methods" section.

(2) **High level wastes.** All waste materials having more than 100 microcuries of either Pu-239, U-233, or U-235 or all three in any combination up to a maximum limit of 100 gram total in aggregate will be considered as high level wastes and will be packed for disposal as outlined below under the "Waste Packaging Methods" section.

Types and Origin of Waste Materials. Waste materials will usually

(a) Only one crate will be shipped during any one working day.

(b) No other configuration of shipping crate will be substituted.

N. Leak Tests

Sealed sources as defined by 10 CFR 70.4 (q) in active use are wiped before being placed in storage and before being removed from storage for active use. All sealed sources in storage are under the custody of the Health Physics Division.

Sealed sources are wiped with either a cotton-tipped swab or a filter paper material such as Whatman #1 of 4.25 centimeter (1-5/8") diameter. Generally, alcohol is used as a wetting agent although other solutions compatible with the source material may be used. The swab or filter paper is usually held with tongs or mounted on a suitable extension device as required by the source configuration and/or radiation dose rate. In most cases the sealed source is wiped, however, if this is not possible, then the most accessible surface of the shielding container (i.e., port, lifting arm) to the proximity of the source is wiped.

Each wipe sample is identified with a number which is recorded on the envelope in which the sample is placed, "Wipe Sample Counting Information" 12ND NRDL-55 (Appendix K). The date of the wipe, location of source (room and/or building number) and the source and source number (number assigned by NRDL to all sealed sources) are also recorded on this envelope.

Counting of beta-gamma wipe samples is done in either a deep-well crystal scintillation counter, essentially a 4π geometry situation or in an end-window Geiger-Mueller tube detector, coupled to an electronic detecting and amplification circuit.

Counting of gamma wipe samples is done in the deep-well scintillation counter unit, which can also be used with the 256 channel analyzer for radioisotope identification. The Laboratory also has available several very sensitive gamma detectors of the ion chamber type and they may be used where analysis of the gamma count is desired. Counters of the end-window Geiger-Mueller type are available and can be used, but their low sensitivity to gamma radiation usually precludes their use.

For wipes of beta sources whose energy is fairly high (> 0.2 Mev)

end-window Geiger-Mueller counting is the method used. For those wipes of sources of low energy (in the Kev range), liquid scintillation counting is available. A deep-well crystal scintillation counter system is utilized, employing such liquid scintillation solvent materials as dioxane or toluene. Also available are gas flow proportional counting systems.

Wipes of sealed alpha sources are counted either in a scintillation counting system or a gas proportional counting system.

The counting systems are calibrated against known radioactive standards, either made from National Bureau of Standards supplied solutions, or purchased from a reliable commercial company who can supply a certified calibrated source. The operating condition, background and efficiency of these counting systems are checked each working day morning and at other times during the day as necessary.

Form 12ND NRDL-493 "Health Physics Division Counting Data" (Appendix I) is used to record the pertinent counting information and results which are reported in microcuries. The results are also recorded on the "Radioisotope Control/Sealed Source" 12ND NRDL-454 (Appendix E) giving a chronological record of the results of the wipes of each individual source.

The counting systems described are capable of detecting in the order of 10^{-5} microcuries of removal beta-gamma activity, 10^{-6} removable gamma activity and 10^{-7} removable alpha activity.

All sources made by the Laboratory or received from an outside manufacturer are wiped tested before being put into use. Should removable activity be detected, the source will be decontaminated and then re-tested after a suitable storage period (usually seven days). If after decontamination, test results indicate the further discharge of radioactive material from the capsule, the source is immediately withdrawn from use, placed in safe storage to await re-encapsulation or disposed of as radioactive waste. If the amount of removable activity exceeds the limit set by the Atomic Energy Commission (3×10^{-5} microcuries) the appropriate governmental agencies will be notified as required by the Atomic Energy Commission and the U. S. Navy regulations.

O. Evaluation of Accident

A fire, explosion, spill or other accident with special nuclear material would in all probability cause only local contamination of

the work space. Local filters in the air exhaust hoods would prevent a serious contaminating event in areas external to the Laboratory.

II. NUCLEAR SAFETY

A. General

The U. S. Naval Radiological Defense Laboratory is a research and development activity and is such, uses no manufacturing or flow processes wherein special nuclear materials can accumulate at one point.

All experiments involving special nuclear materials will be isolated from other such experiments and an upper limit will be placed upon the quantity present in any working space. The upper limit has been set at the point where no criticality can occur. The general administrative procedures for insuring nuclear safety are described in NRDL Instruction P5100.11 (Appendix F).

Two-hundred-fifty (250) grams of any unsealed special nuclear material will be designated as one unit. No more than one unit will be used in any room or other adjacent work space at any time. No quantities of unsealed special nuclear material greater than one gram may be used in rooms adjacent to a room where a unit is being used. In no event will the buffer distance be less than twelve (12) feet.

The 250 grams designated as a unit is below the amounts set in TID-7616, Rev 1 "Nuclear Safety Guide 1961", Table 1 "Values of Basic Nuclear Parameters to Avoid Nuclear Hazards".

The Health Physics Division must be notified in advance before gram quantities of unsealed special nuclear material may be moved from any room.

Investigators will notify the Health Physics Division of each intended use of one gram or greater quantity of unsealed special nuclear material so that a representative of that division will be present during the experiment. Gram quantities of special nuclear material not in use will be stored with the Health Physics Division.

The 760 gram Pu-239 F₄ sealed source is stored separately from other special nuclear material. It is equipped with a beta-gamma continuous monitoring alarm system. (Visual and audible.)

B. Receiving and Storage

All incoming special nuclear material is received and unpackaged by the Health Physics Division. The package is given a visual inspection and a contamination check by a health physicist. The package label showing isotope and quantity are checked against the transfer papers to verify quantities received. The materials are stored in the radioisotope storage facility under the conditions of nuclear safety as outlined in NRDL Instruction P5100.11 (Appendix F).

All sealed special nuclear material/^{neutron}sources are doubly encapsulated and stored in paraffin-filled steel drums (15 gallons for PuBe; 25 gallons for Pu F₄).

Unsealed special nuclear materials are stored in the shipping capsule or container until required by scientific investigators.

C. Handling and Processing

The handling and processing procedures have been described, in general, under Section I of this application. Nuclear safety will be accomplished by placing an upper limit of special nuclear material in a working space, such limit to include wastes, filter loading, scrap and solutions. Quantities will be determined by the analytical method appropriate in each case, including weighing, alpha, beta or gamma counting, radioassay, and surface contamination methods.

III. COMBINED OPERATION

For the purposes of nuclear safety control, no distinction will be made between licensed SNM, SS Station SNM or Section 91b SNM. The upper limit of 250 grams of SNM in a working space will apply to the combination of U-235 and Pu-239 present.

IV. SHIPMENT

All shipments will be made in accordance with existing Department of Transportation regulations and with the regulations outlined in 10 CFR 71.

2-16-70

Telcon From Al Keilwasser (1:15 PM (noon))

8-799-2759 (Autovon)

415-641-2759 (Regular)

1. Calling reference to preparation of AEC forms & ltr. requesting termination of SNH-35.

2. Have been checking into forms covering the (2) AN/VOH-7B Alpha Calibrators, under contract with Atomchem, contain Plutonium sources (i.e. each α Calibrator contains $\approx 818 \mu\text{gms } ^{239}\text{Pu}$). Units lost in shipment on GEL - during return to Contractor from the Lab).

Had D. Helton discuss this with Al. Keilwasser since transportation, contracting officer, contractor - adjustment for loss to Contractor, etc. may be involved.

3. Amendment #1, dtd. 3 Feb. 1970, lic. #04-13488-01 terminating the Byproduct Mtl. License has been rec'd. The termination of source mtl. license

SMB-376, dtd. 4 Feb. 1970 forwarded as encl (1). To 9900 Ser 30-0516, dtd. 9 Feb. 1970 has not been rec'd as of this dte. A check of mail at Shipyard will be made & should this have ^{any} been lost I'll send a quick copy of over the with termination of SMB-376 to the Shipyard.

4. Al - working for: Mr. R. C. Tarland, Dir. of Mgmt. Eng.

Code H-140, Bldg. 101, Rm 1303

Hunters Pt. Nav. Shipyard 94133

3-19-69

Nov. 1, 1968 ltr. from AEC —

Relevant to app. for renewal (i.e. our 1st, Encl. Ser. 0516-157 of 1 July 1968 on NRDL's application for renewal of SNM-35).

Requested further info —

This ltr. states "request for renewal was filed more than 30 days prior to expiration; accordingly, pursuant to § 70.33(b), 10CFR 70, this license shall not expire until renewal application has been finally determined by the Commission."

^{2/14/69}
On ~~14 Feb~~ Lab. sent to AEC via NAUELEX supplemental info - answering the questions raised by AEC.

9673
Ser 409 - 0516

MAR 17 1969

From: Commander, Naval Electronic Systems Command
To: Chief of Naval Material
Department of the Navy
Washington, D. C. 20360

Subj: Requirements for Special Nuclear Material; annual report of

Ref: (a) NAVMAT ltr MAT 04124A/JJBII of 25 Feb 1969

1. In accordance with the request of reference (a) the following Special Nuclear Material is requested for Fiscal Year 1970:

<u>Isotope</u>	<u>Enrichment Wt.</u>	<u>Metric Qty.</u>	<u>Application</u>
Pu239	100%	160 grams	The Plutonium to be obtained as listed is for Neutron Calibration Sets, Nomenclature UDM-5(-), used by ship and shore repair facilities to calibrate neutron instrumentation used for shield survey work in nuclear reactor compartments, by personnel in research efforts and by industrial hygienists in safety programs. Each calibrator contains a quantity of one 80 gram (5 curie) PuBe source.

Copy to:
ELEX 0516
ELEX 051
ELEX 012

M. G. WILLIAMS
By Direction

9900

Ser 340 - 0516

NOV 8 - 1968

From: Commander, Naval Electronic Systems Command
To: Commanding Officer
Naval Radiological Defense Laboratory
San Francisco, California 94135

Subj: Special Nuclear Material License No. SNM-35

Ref: (a) FONECON between Mr. Mahaffey, NAVELEX and Mr. Smith, NRDL
on 6 NOV 1968

Encl: (1) AEC letter DML:LR 70-35 with attachment of 1 NOV 1968

1. Enclosure (1) covers specific questions raised by the Atomic Energy Commission during the evaluation of the application for renewal of subject license.
2. To expedite and facilitate the preparation of supplemental information required, the areas of interest were discussed during the telephone conversation, reference (a).
3. It should be noted that the application for renewal has been timely filed and action on the application will continue upon receipt of the requested material.

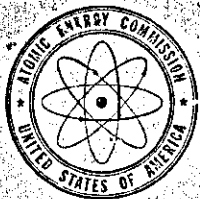
Copy to:
BUNED (Code 74)

M. G. WILLIAMS
By direction

Called Lab on 1/15/68 re-to this add'l. mtl.
being prepared by Lab. Working on it now.

MAHAFFEY/mitchell Also discussed plan of sending Lab
61457 - 11/8/68
Serial 1105-082-68 (2) preproduction units of AN/UDM-7

Radiation Calibrator for (2) instrumentation. Each has
a 55 μ Ci of Pu per source. Can accept the (2) for
evaluation under SNM-35.



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

NOV 1 1968

DML:LR
70-35

*Recd. 11/5/68 & fwded
as encl. (1) to ser. 0516-340 of 8 Nov. 1968.
Received areas of question during
phone call with A. Smith on 11/6/68*

Department of the Navy
Naval Electronic Systems Command
Washington, D. C. 20360

Attention: Mr. M. G. Williams

Gentlemen:

Your reference: 9900, Ser. 157-0516

This refers to your application for renewal of Special Nuclear Material License No. SNM-35 covering the activities conducted by the U. S. Naval Radiological Defense Laboratory, San Francisco, California. In order that we may continue our review, please provide the information indicated in the attachment.

Your request for renewal of this license was filed more than 30 days prior to its expiration; accordingly, pursuant to paragraph 70.33(b), 10 CFR 70, this license shall not expire until the renewal application has been finally determined by the Commission.

Sincerely,

Robert L. Layfield
Robert L. Layfield
Source & Special Nuclear Materials
Branch
Division of Materials Licensing

ACTION: 0516

INFO: *Om*

F.H. 9900

1105 081-68

NOV 1 1968

A T T A C H M E N T

U. S. Naval Radiological Defense Laboratory

San Francisco, California

1. Describe your glovebox supply-exhaust system in more detail. Specify the minimum pressure differential of the boxes with respect to room air, describe the system for maintaining and monitoring this pressure differential, and indicate the linear air flow rate that the exhaust system will provide through an open glove port.
2. With respect to glovebox filtration, please confirm that the high efficiency filters in the exhaust system are the fire resistant type. Also, from the description provided in your application, it appears that your glovebox atmosphere may be exhausted through a single high efficiency filter before being discharged to the environs. Normally, two stages of high efficiency filtration are employed for gloveboxes used for high specific activity alpha emitters. If this is not the case for your glovebox exhaust system, please evaluate the consequences of failure of the single filter, taking into consideration the quantities of material and the type of operations performed in the gloveboxes. If make-up air for each glovebox is not drawn through a high efficiency filter, please also provide an evaluation of the consequences of box pressurization.
3. On page 5 of the application and in Exhibit F, the NRDL Radiological Safety Manual, you state that periodic urinalysis is required for persons working with radioactive materials. Please specify the minimum frequency for routine urinalysis for persons working with plutonium and briefly describe the method of analysis, indicating for plutonium the specificity of the analysis, the recovery yield, and the sensitivity in terms of activity units per 24-hour sample. Also indicate, in terms of the urinalysis result, the action or investigation level for follow-up sampling and evaluation.
4. On page 17 of the application, in connection with waste disposal practices, you refer to a procedure for removal of plutonium from solutions by absorption on a suitable ionexchange medium. If this procedure involves nitrate-form anion exchange resins, describe your safety provisions and controls considering any potential for explosion and/or fire under your conditions of use.
5. Your application refers to the use of respiratory protective equipment. Please note that allowance may not be made for the use of such equipment in determining the exposure of individuals to airborne concentrations without specific Commission approval. Application for approval of the use of such equipment should be submitted pursuant to paragraph 20.103(c) of 10 CFR 20. This does not mean, however, that such equipment cannot be used to further reduce personnel exposure below the limits specified in Appendix B, 10 CFR 20.

U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY
SAN FRANCISCO, CALIFORNIA 94135

IN REPLY REFER TO:

730- 430

ALS:kmm

24 SEP 1968

*Recd. on 9/27/68 & fwded to AEC by 1st Encl
Ser 0516 313 of 30 Sept. 1968*

From: Commanding Officer
To: Chief, Source and Special Nuclear Materials Branch,
Division of Materials Licensing, U. S. Atomic Energy
Commission, Washington, D. C. 20545
Via: Commander, Naval Electronic Systems Command,
(Code 05163), Munitions Building, 18th & Constitution
Avenues, Washington, D. C. 20390

Subj: Modification of Naval Radiological Defense Laboratory's
(NRDL) Applications for Source Material License No.
SMB-376 and Special Nuclear Material License No. SNM-35.

Ref: (a) NRDL ltr 730-118 AK:kmm dtd 30 Jun 1967
(b) NRDL ltr 730-398 AK:kmm dtd 25 Jun 1968

Encl: (1) Supplement 3 (Item 10) Radiological Safety Committee
Members and Qualifications (two copies)
(2) Pages 3 and 4, Radiological Safety Committee
Members and Qualifications (two copies)

1. As a result of a recent change in staffing at NRDL, it is necessary to make a change in the membership of the Radiological Safety Committee. Dr. Edward R. Tompkins has been replaced by Dr. Edward L. Alpen as Chairman. Dr. Thomas R. Birdwell, LCDR, MC, USN, has been replaced by Dr. Charles D. Guri, LCDR, MC, USN as an Alternate Chairman.

2. It is requested that enclosure (1) replace Supplement 3 (Item 10) (Pages 3 and 4) of reference (a) and that enclosure (2) replace (Pages 3 and 4) as submitted in reference (b).

C. D. GURI
By direction

Supplement 3 (Item 10)

Radiological Safety Committee and Qualifications

Dr. Edward L. Alpen, Chairman

Head, Biological and Medical Sciences Division, NRDL, April 1959 to date; Head, Biophysics Branch, NRDL, 1956 - April 1959; Head, Thermal Injury Branch, NRDL 1952 - 1956; Investigator in Thermal Injury Branch NRDL, April 1951 - September 1952; Assistant Professor Pharmacology, George Washington University, Washington, D. C., January 1950 - April 1951.

Dr. Charles D. Guri, LCDR, MC, USN, Alternate Chairman

Head, Medical Department, NRDL, July, 1968 to date; Investigator, Biological and Medical Sciences Division, NRDL, July 1966 to date; Research Fellow in Medicine, Robert B. Brigham Hospital, Boston, Massachusetts, July 1962 - June 1966; Junior Assistant Resident in Pathology, St. Vincent Hospital, Worcester, Massachusetts, July 1961 - June 1962; Intern St. Vincent Hospital, Worcester, Mass., July 1960, - June 1961; M. D., Georgetown University School of Medicine, Washington, D. C., 1960.

Albert L. Smith, Alternate Chairman

Head, Health Physics Division, NRDL, February 1962 to date; Head, Radiological Safety Branch, Health Physics Division, NRDL, July 1956 - February 1962; Health Physicist, NRDL, October 1951 - July 1956; Health Physicist, General Electric Corp., Hanford Atomic Products Operation, January 1948 - October 1951.

Dr. Richard Cole

Head, Chemical Technology Division, NRDL, September 1964 to date; Head, Countermeasures Evaluation Branch, Military Evaluations Division, May 1959 - September 1964; Radiological Chemist, Military Evaluations Division, December 1956 - May 1959; Radiological Chemist, Chemical Technology Division, March 1952 - December 1956.

Dr. C. Sharp Cook

Head, Nucleonics Division, NRDL, November 1965 to date; Physics Consultant to Scientific Director, NRDL, 1962 - 1965; Fulbright Research Fellow, Aarhus University, Aarhus, Denmark, 1960 - 1962;

Supplement 3 (Item 10) (Continued)

Head, Nucleonics Division, NRDL, April 1960 - August 1961; Head, Radiation Characteristics and Effects Branch, NRDL, 1959 - 1960; Head, Nuclear Radiation Branch, NRDL, 1953 - 1959; Assistant Professor of Physics, Washington University, St. Louis, Missouri, 1948 - 1953; Research Assistant, Indiana University, 1946 - 1948; Teaching Assistant, Indiana University, 1940 - 1942.

Paul E. Zigman

Head, Technical Management Office, NRDL, April 1964 to present; Head, Applied Research Branch, 1961 - 1964; Supervisor and Research Specialist, Atomics International, 1959 - 1961; Head Analytical and Standard Branch, NRDL, 1955 - 1959; Investigator, NRDL 1948 - 1955.

Dr. William E. Kreger

Head, Physical Sciences Division, NRDL, November 1966 to date; Director, Cyclotron Project, NRDL, November 1965 - 1966; Head, Nucleonics Division, NRDL, 1961 - 1965; Head, Nuclear Radiation Physics Branch, NRDL, 1958 - 1961; Senior Investigator (Nuclear Physicist), Shielding Section, NRDL, 1952 - 1957.

NOTE: Each member has two (2) alternates whose qualifications are commensurate with their positions, usually Branch Heads.

in quartz capsules which are in turn encapsulated in aluminum capsules. Typical aluminum capsules are shown in Apendices A-3, A-4 and A-5. The capsules are leak tested by Reactor personnel before irradiation.

As cyclotron neutron targets, the special nuclear materials consist of metal foils or solution evaporated onto mylar film, doubly wrapped in polyethylene film. The materials are exposed to neutron by placement near the accelerator neutron-producing target.

C. Administrative Controls

Special nuclear materials will be used under the supervision and control of the U. S. Naval Radiological Defense Laboratory personnel in accordance with procedures established by the Radiological Safety Committee of NRDL. The members and qualifications of the Radiological Safety Committee are as follows:

(1) Dr. Edward L. Alpen, Chairman

Head, Biological and Medical Sciences Division, NRDL, April 1959 to date; Head, Biophysics Branch, NRDL, 1956 - April 1959; Head, Thermal Injury Branch, NRDL 1952 - 1956; Investigator in Thermal Injury Branch, NRDL, April 1951 - September 1952; Assistant Professor Pharmacology, George Washington University, Washington, D. C., January 1950 - April 1951.

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(7) Dr. Richard Cole

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NOTE: Each member has two (2) alternates whose qualifications are commensurate with their positions, usually Branch Heads.

The responsibilities of the Health Physics Division include the control and accountability of all radioisotopes including special nuclear materials used in the Laboratory. The control procedures require the use of specific forms.

Individual use-approval forms called "Radionuclide Use Approval" 12ND NRDL-44 (Appendix B) and "Modification of Radioisotope Use Approval" 12ND NRDL-44A (Appendix C) are initiated by each experimenter when a particular special nuclear material is required. This experimental plan is reviewed by the investigator's Division Radiological Safety Committeeman who has supervisory cognizance over the experimental

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MONSANTO RESEARCH CORPORATION

DAYTON LABORATORY • DAYTON, OHIO 45407

NUCLEAR SOURCES DEPARTMENT
1515 NICHOLAS ROAD
AREA CODE 513
PHONE 298-5481

December 24, 1963

Mr. A. L. Smith
Health Physics Division
U.S. Naval Radiological Defense Laboratory
San Francisco, California 94135

Reference: 730-101 WJF-JP

A 6.2
WJF 11/11/63

Dear Mr. Smith:

(12) { FADPT
FTF
RPM
AK - WJ

Plutonium-238-beryllium Neutron Source

We have fabricated a number of neutron sources from plutonium-238. It is necessary that we have the Pu-238 furnished by the customer. For neutron sources Pu metal is required.

The average neutron yield is about 2×10^6 n/sec/curie. Hence, emission of 1.5×10^8 n/sec requires approximately 75 curies, or 4.5 grams of Pu-238. As the plutonium is only about 80% Pu-238, the total plutonium will be 5.6 grams.

The inner container is tantalum and the outer 304-stainless steel. We propose dimensions of 0.515" diameter by 0.70" long inside by 0.625" diameter by 0.90" long outside for the tantalum and outside dimensions for the steel of 0.70" by 1.25". A tapped 1/4-20 thread is included in the length. Dimensions can be altered somewhat if the internal volume is retained.

To our knowledge there is no published neutron spectrum of Pu-238-Be sources. It should not be greatly different from that of a Pu-239-Be source. The gamma emission is about 6 mr/hr at one meter.

The charge for fabrication is \$1700. A deposit of \$150 on the shipping container is extra and will be refunded when it is returned prepaid.

A source can be shipped in about three weeks after receipt of an order and the Pu-238.

Very truly yours,

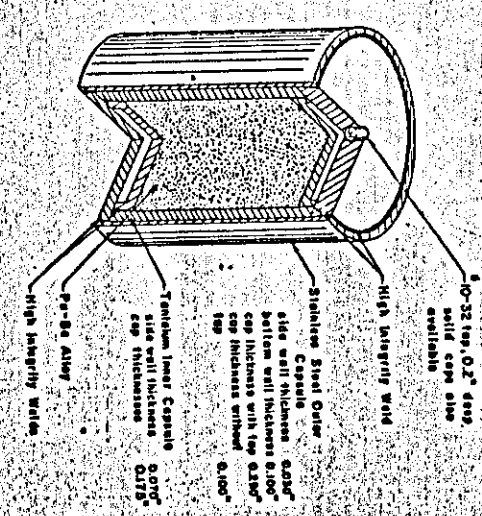
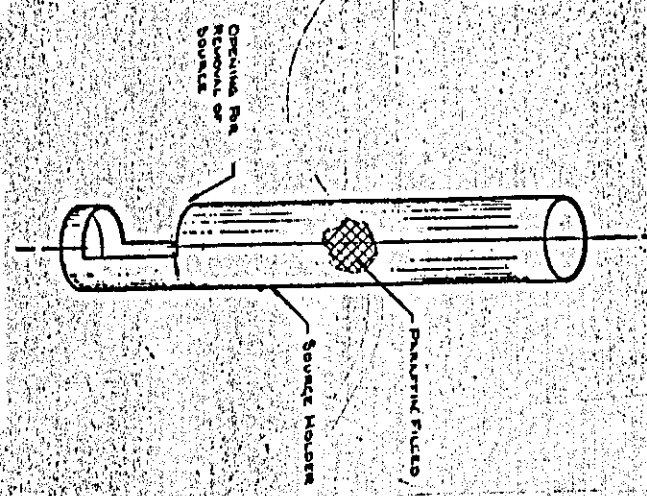
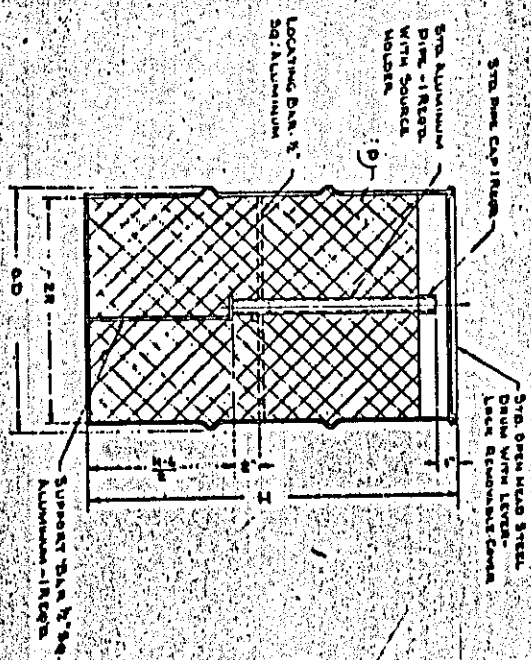
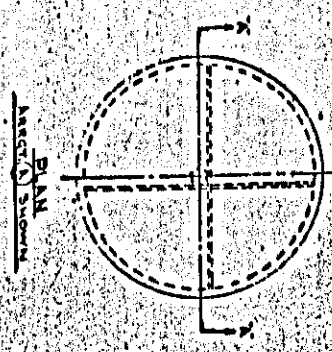
J. L. Richmond

J. L. Richmond
Manager

mmm

cc: A. L. Smith

Appendix A



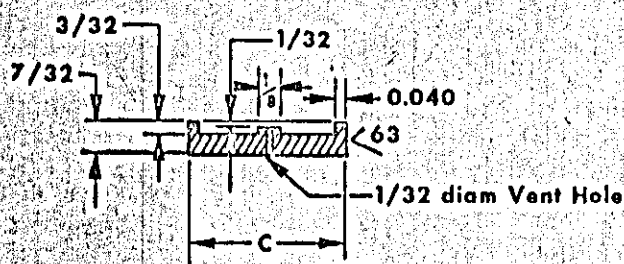
Standard NUPEC Plutonium-Beryllium Neutron Source

K - CONTAINER SIZE	A
V - DIET SIZE	FOA
Z - DIET REMOVAL	A
P - PLASTIC	-

SHIPPING AND STORAGE CONTAINERS

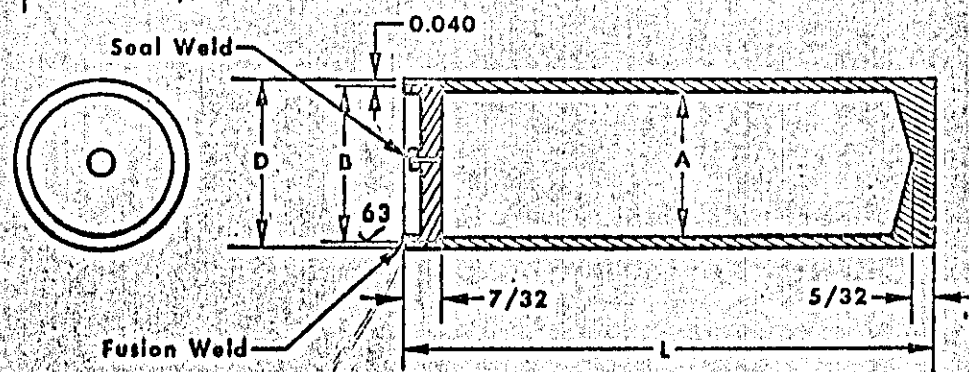
FIGURE 2

CONTAINER SPECIFICATION				
CONTAINER SIZE	WALL THICKNESS	TEMPERATURE	WEIGHT	WEIGHT
15 GALL.	15	172°	1 1/2	2.1 N
				125°



Surface 125
Fractions $\pm 1/64$
Decimals ± 0.005

Material: 1100 Aluminum, any Temper



all dimensions in inches

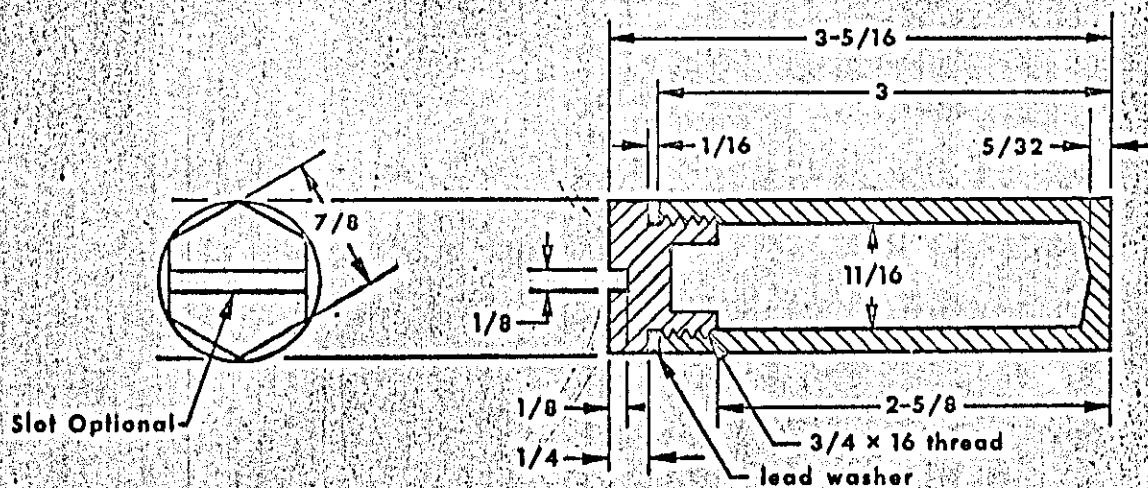
L	2in. Minimum to 4in.* Maximum				
D	0.500* (min)	0.625	0.750	0.875	1.000* (max)
A	0.406	0.500	0.593	0.607	0.812
B	0.420 0.419	0.545 0.544	0.670 0.669	0.795 0.794	0.920 0.919
C	0.423 0.422	0.548 0.547	0.673 0.672	0.798 0.797	0.923 0.922
*Available from General Electric Stock					

STANDARD GETR WELDED SHUTTLE CAPSULE

Appendix A-3

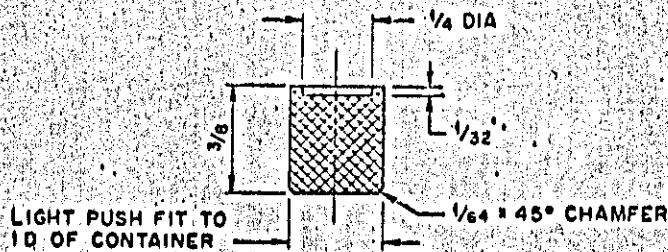
Surface 125
Fractions $\pm 1/64$
Decimals ± 0.005

Material: 6061-T6 Aluminum, (hexagonal stock)



STANDARD GETR SCREW - TOP SHUTTLE CAPSULE

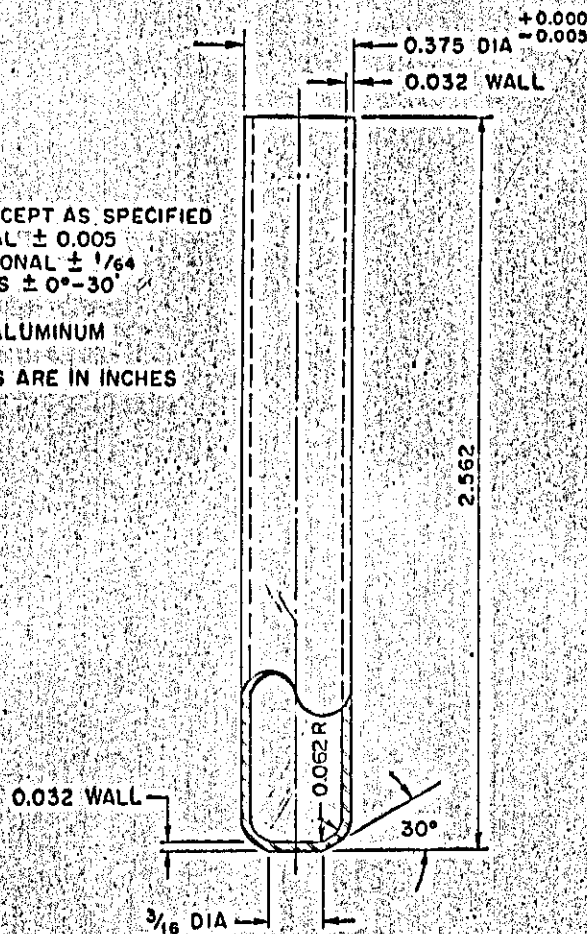
Appendix A-4



TOLERANCES EXCEPT AS SPECIFIED
DECIMAL ± 0.005
FRACTIONAL $\pm 1/64$
ANGLES $\pm 0^\circ-30^\circ$

MATERIAL - 2S ALUMINUM

ALL DIMENSIONS ARE IN INCHES



ORR Irradiation Can and Cap.

RADIOISOTOPE USE APPROVAL
12ND NRDL-44 (Rev 3/65)

1. Prepare original and 2 complete copies, including any sketches, drawings, etc.
2. Forward all 3 copies, as provided.
3. Use Form 12ND NRDL-44A for variations

from previously approved Form 12ND NRDL-44.

4. Form 12ND NRDL-44 should be re-submitted after a period of one year.

ROUTING	CODE	APPROVAL SIGNATURE	DATE
From			
To Radiological Safety Chairman, Radioisotope Committee			
Via Radiological Safety (1) Division Radioisotope Committeeman			
(2) Health Physics Division			

It is requested that approval be granted for the use and the manner of use for the following radioisotopes.

Radioisotopes	Chemical Form	Special Irradiation Service
Quantity (mc or gram)	Date Required	Activity Per Experiment
Location of Use	Zone Level	AUTHORIZED USERS
		NAME CODE
WASTE CONCENTRATIONS AND AMOUNTS		
Gas		
Liquid		
Solids		

Experimental Title or Brief Description

Proposed Procedure (Attach sketch or description of apparatus)

Radiological Safety Precautions to be Taken by the Investigator

MODIFICATION OF RADIOISOTOPE USE APPROVAL
12ND NRDL-44A (Rev. 1/66)

1. Use only when modifying original request, Form 12ND NRDL-44.
2. Prepare original and 2 copies, including sketches, drawings, etc., if any.
3. After Branch Head has signed forward all copies to Code 730.

From (Branch Code)	Date	Investigator & Room No.	Previous Stub No. Reference
--------------------	------	-------------------------	-----------------------------

To	Radiological Safety	Via	Health Physics Division, Code 730
Chairman, Radiological Safety Committee, Code 901			

It is requested that the following modification of original 12ND NRDL-44 be approved:

Radiological Safety	
Signature of Branch Head	Signature of Chairman, Radiological Safety Committee

RADIOISOTOPE USE INVESTIGATION
12ND NRDL-76 (Rev 6/65)

Adequate Safety Precautions Being Taken in Experiment

☐ Yes

☐ No

Special Equipment Requirements and Comments

Signature of Health Physics Investigator

Date

Reviewed by Head, Health Physics Division

Date

RADIOISOTOPE CONTROL
12ND NRDL-455 (Rev 8/65)

Isotope _____ Quantity _____ Stub No. _____

Experimenters _____ Location _____

Date Stub Processed _____ Date Mat. Recv'd _____

Assay Date _____ Chemical Form _____

Supplier and Lot No. _____

REMARKS _____

RADIOISOTOPE CONTROL/SEALED SOURCE
12ND NRDL-454 (Rev 9/65)

Isotope _____ NRDL Source No. _____ Stub No. _____

Quantity _____ Assay Date _____ Half-Life _____

Date Stub Processed _____ Date Mat. Rec'd _____

Supplier & Ident. _____

Leak Test (Wipe)			Source Location		
Date	µc	Initial	Room	Date	Custodian

DATE OF WIPE			WIPE NO.		
LOCATION (WHERE TAKEN)			Source and No.:		
TYPE CONT.	RADIAC C/M	SCALER C/M	D/M	DATE COUNT.	INITIAL
α					
β - γ					
SIGNATURE OF MONITOR					
WIPE SAMPLE COUNTING INFORMATION (2ND NRDL 55) (4-56)					

SCALE
NONE

DATE
NOV. 30, '64

PROJECT NO.

TITLE
(SPEC 12)
RADWASTE CONTAINER

DRAWING NO.
246C-794

ALTERATION

DRAWN BY
S.W. LEE

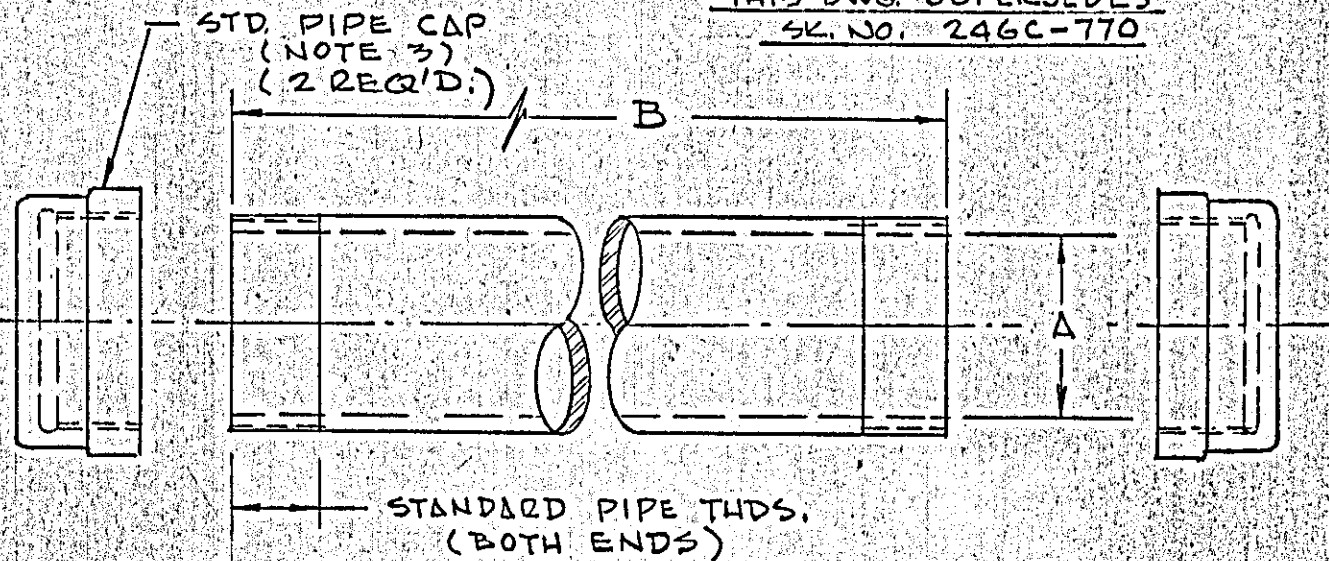
CHECKED BY
FJA

APPROVED BY
R/M

SATISFACTORY TO

DATE

THIS DWG. SUPERSEDES
SK. NO. 246C-770



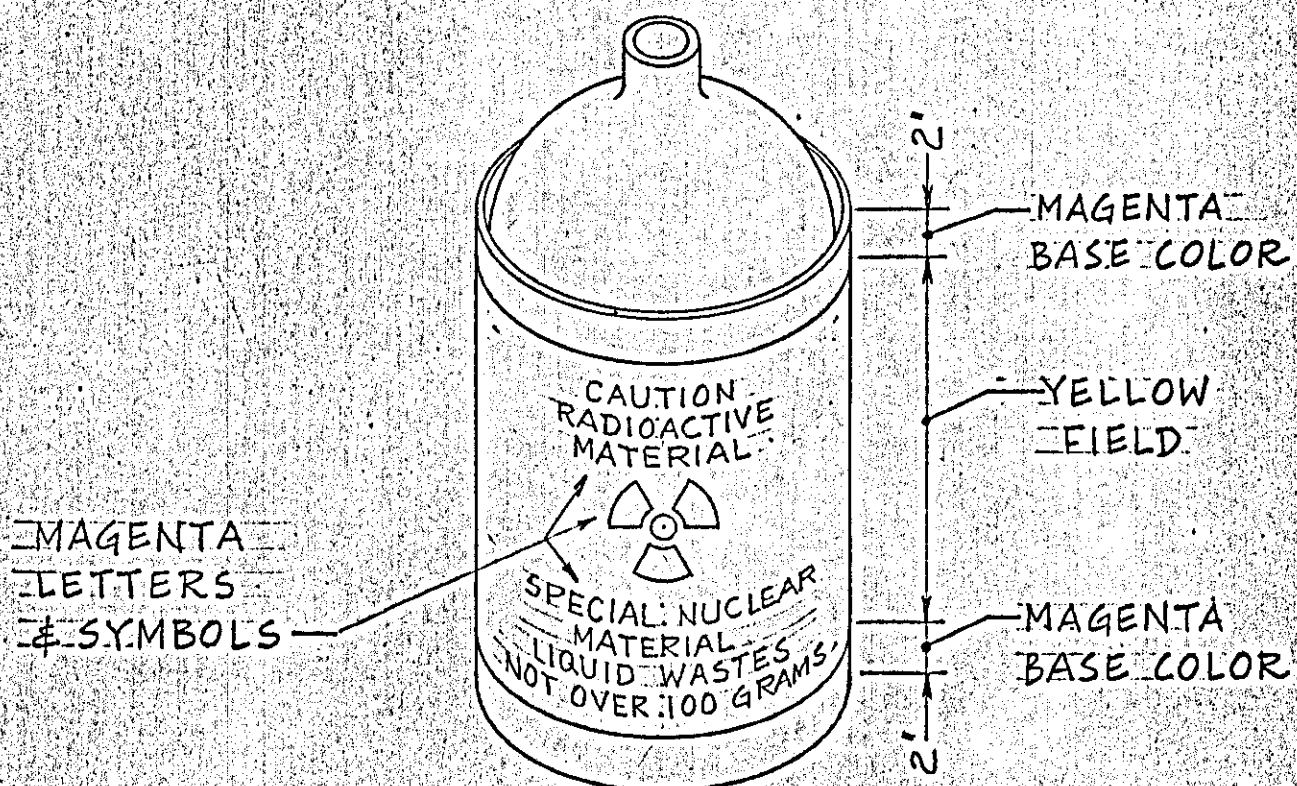
PIPE SCHEDULE		
TYPE	DIM. "A" (I.P.S.)	DIM. "B"
1	2"	12"
2	3"	12"
3	4"	12"
4	6"	16"

NOTES:

1. CONTAINER TO MEET I.C.C. SPECIFICATION 2R.
2. ALL PIPES TO BE SCHED. 40 STD. WROUGHT STEEL.
3. ALL PIPE CAPS TO BE SCHED. 40 STD. MALLEABLE IRON.
4. APPLY WHITE LEAD TO THREADS AS REQUIRED FOR WATER TIGHT INTEGRITY.

Appendix I

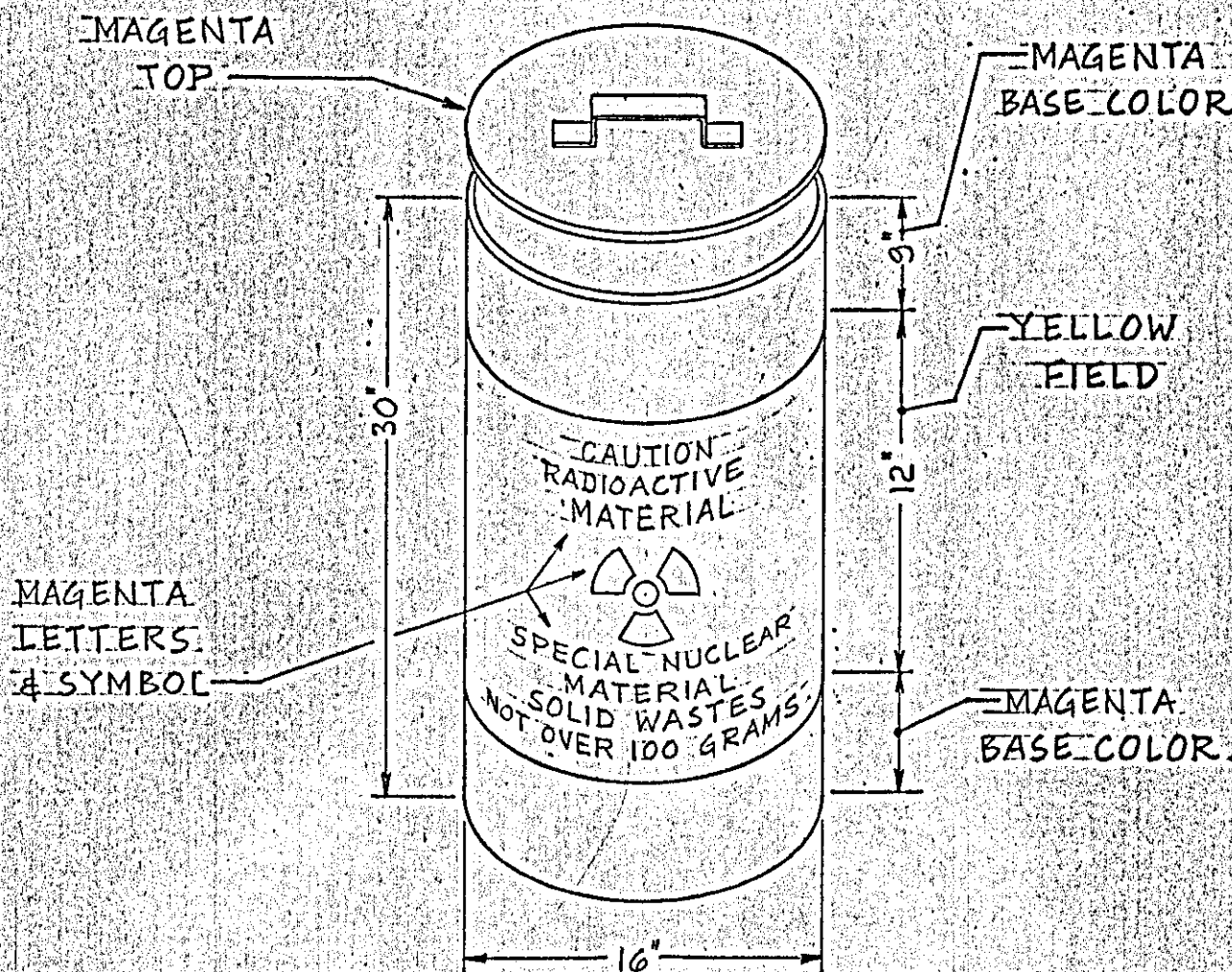
REVISIONS		TITLE	
		3NM LIQUID RADWASTE CONTAINER	
		NAVAL RADIOLOGICAL DEFENSE LABORATORY SFNS SAN FRANCISCO, CALIFORNIA	
		DRAWN BY	
		G.S., 12-23-64	
SCALE		APPROVED	
NONE		M-64-100	



GENERAL NOTES:

1. CONTAINER MATERIAL: STANDARD 5 GAL. STEEL BUCKET.
2. CONTAINED JUG TO BE VIRGIN NATURAL POLYETHYLENE.
3. RADIATION SYMBOL TO BE 4" DIA., ALL OTHER DIMENSIONS AS PER NRDL-DRAWING M-58-79.
4. LETTERS TO BE $\frac{3}{4}$ " HIGH MIN.
5. SAME DESIGN ON OPPOSITE SIDE OF CONTAINER.
6. ALL DIMENSIONS ARE APPROXIMATE.

REVISIONS		TITLE SNM SOLID RADWASTE CONTAINER	
		NAVAL RADIOLOGICAL DEFENSE LABORATORY SFNS SAN FRANCISCO, CALIFORNIA	
		DRAWN BY A.S., 12-23-64	M-64-99
SCALE NONE		APPROVED	



GENERAL NOTES:

1. CONTAINER MATERIAL: FIBER DRUM.
2. CONTAINER TO BE LINED WITH REMOVABLE POLYETHYLENE BAG.
3. RADIATION SYMBOL TO BE 4" DIA., ALL OTHER DIMENSIONS AS PER NRDL-DRAWING M-58-79. LETTERS TO BE $\frac{3}{4}$ " HIGH MIN.
4. SAME DESIGN ON OPPOSITE SIDE OF CONTAINER.
5. ALL DIMENSIONS ARE APPROXIMATE.

TITLE
RADWASTE DISPOSAL BOX

DRAWING NO.
246C-769

ALTERATION

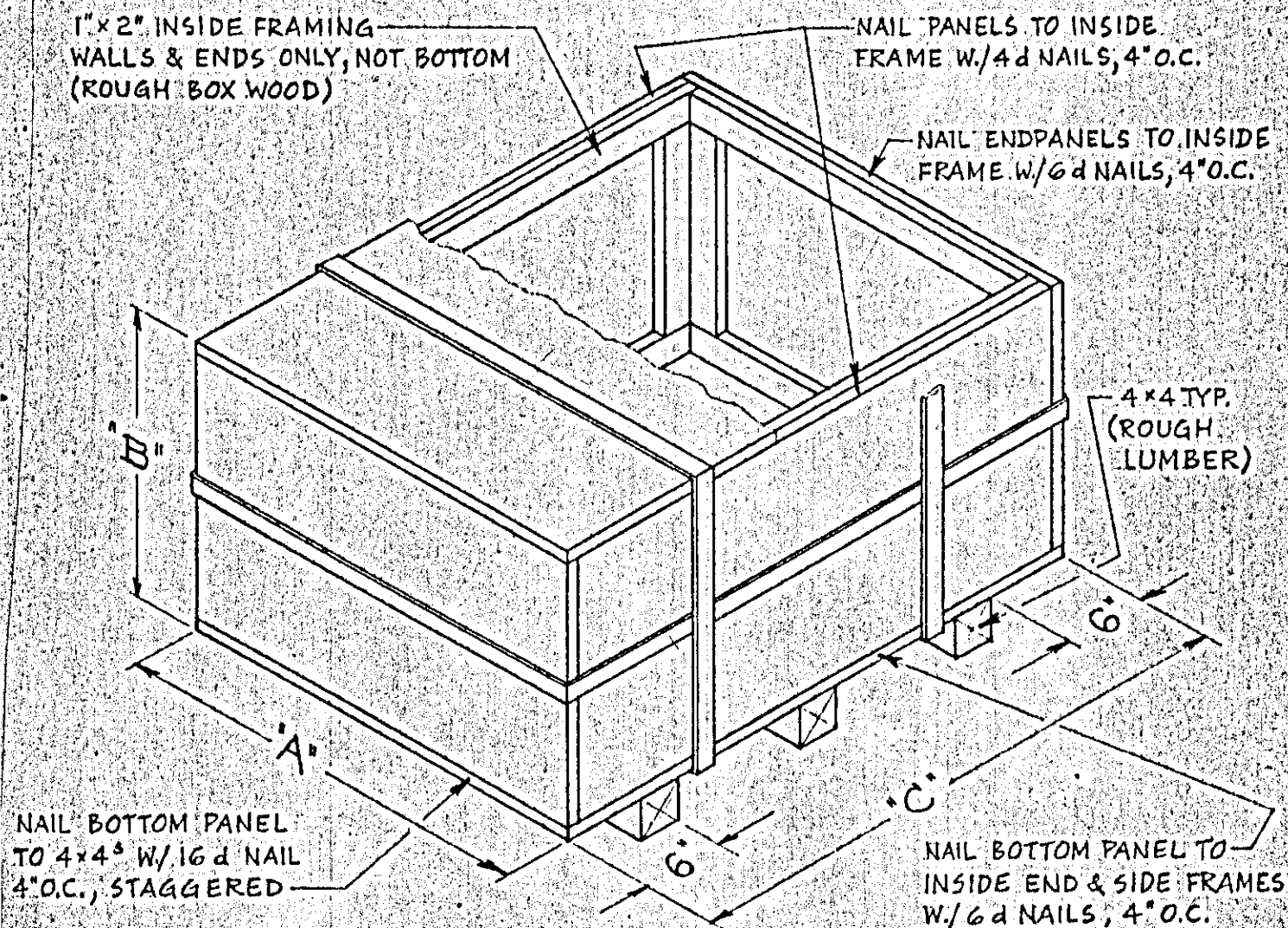
DRAWN BY
G.S.

CHECKED BY

APPROVED BY

SATISFACTORY TO

DATE



BOX SCHEDULE			
	"A"	"B"	"C"
TYPE I	44	24 5/8	9 1/2
TYPE II	44	24 5/8	96

GENERAL NOTES:

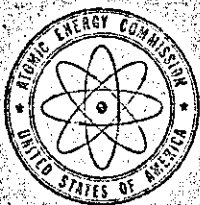
1. MAKE BOX FROM 5/8" THICK PLYWOOD GRADE C-D INTERIOR UNSANDED.
2. USE CEMENT COATED NAILS.
3. INSTALL 3/4" WIDE STEEL BANDS AS SHOWN AFTER PACKING IS COMPLETED.

Appendix J

[illegible]

Appendix I





UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAY 31 1968

IN REPLY REFER TO:

DML:LR
70-35
SNM-35, Amendment No. 5

*Rec'd: 6/6/68 & fwd.
orig. to Lab. on 6/10/68*

Department of the Navy
Naval Electronic Systems Command
Washington, D. C. 20360

Attention: Mr. M. G. Williams

Your references: 9900, Ser 72 - 0516
9900, Ser 116 - 0516

Gentlemen:

Pursuant to Title 10, Code of Federal Regulations, Part 70, Items 4, 7 and 8 of Special Nuclear Material License No. SNM-35, dated May 27, 1965, and held by the Naval Radiological Defense Laboratory, are hereby amended to read as follows:

"4. August 31, 1968.

"7. Plutonium: 982 grams Pu-239 in any form; 760 grams Pu-239 encapsulated as a Pu-F neutron source; 259 grams Pu-239 encapsulated as Pu-Be neutron sources; 55 grams Pu-238 in any form; and 20 grams Pu-238 encapsulated as Pu-Be neutron sources.
U-235: One (1) kilogram in any form.
U-233: 30 grams in any form.

"8. For use in accordance with the statements, representations and conditions specified in the licensee's application dated August 15, 1961, and supplements dated December 19, 1961; February 26, 1962; January 8, February 10, April 28, August 18, October 14, and December 8, 1965; October 6, 1966; March 29 and May 14, 1968."

All other conditions of this license shall remain the same.

ACTION;

INFO:

FILE NO:

CON NC0605-022-68

Department of the Navy

- 2 -

Please note that this amendment extends the expiration date of License No. SNM-35 to August 31, 1968, to enable completion of your renewal application, and increases the possession limit of plutonium 238 in any form to 55 grams as requested in your application dated March 29, 1968.

FOR THE ATOMIC ENERGY COMMISSION

Robert L. Layfield
Robert L. Layfield
Source & Special Nuclear Materials
Branch
Division of Materials Licensing

730-374

ALS:kmm

9 MAY 1968

AIRMAIL

From: Commanding Officer and Director
To: Chief, Source and Special Nuclear Materials Branch,
Division of Materials Licensings, AEC
Via: Commander, Naval Electronic Systems Command (Code 05163),
Munitions Building

*Recd. 5/13/68 & fwded.
as encl(1) to AEC by
ser 0516 116 of 14 May 1968*

Subj: AEC Special Nuclear Material License No. SNM-35; request
for extension of

1. The U. S. Naval Radiological Defense Laboratory's Special Nuclear Material License No. SNM-35 has an expiration date of 31 May 1968. The application for license renewal is now in preparation and is expected to be mailed within the next two weeks.

2. It is requested that SNM-35 License be extended for a period of 30 days in order that we may comply with the provisions of 10 CFR 30.37 (b).

C. D. GURI
By direction

ACTION: 05163
INFO: 9966

File No. 9966
0513-012-68

9900

Ser 116 - 0516

FIRST ENDORSEMENT ON NRDL LETTER 730-374 ALS:kmm OF 9 MAY 1968

MAY 14 1968

From: Commander, Naval Electronic Systems Command
To: Chief, Source and Special Nuclear Materials Branch
Division of Materials Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

M. G. WILLIAMS
By direction

Subj: AEC Special Nuclear Material License No. SNM-35

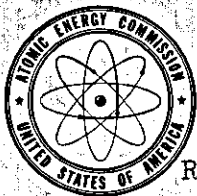
1. Basic letter contains a request to amend subject license to extend the expiration date to ~~31 May 1968~~ 30 June 1968.
2. The additional time is required to prepare the application for renewal of license No. SNM-35 which is currently being processed.

Copy to:
BUMED(Code 74)
NRDL, SFRAN

5/31/68

Checked with D. A. Nussbaumer's
Office. Amendment to extend exp.
date 3 mos. out of Office today.

MAHAFFEY/mitchell
61457 - 5/14/68



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

REF:DML:ND
70-35

MAR 28 1968

Department of the Navy
Naval Electronic Systems Command
Washington, D. C. 20360

SUBJECT: NOTICE OF LICENSE EXPIRATION

Gentlemen: Attention: Mr. C. S. Hollander

Notice is given that Special Nuclear Material License Number SNM-35 expires on May 31, 1968.

If you desire to continue your program using special nuclear material(s), an application for renewal of the license should be filed with this office pursuant to Title 10, Code of Federal Regulations, Part 70, Section 70.33. The application should be in letter form and seven copies submitted.

It is to your advantage to file such an application at least thirty (30) days before the expiration date of your existing license. Your program will then be covered by your existing license until action is taken on your application for license renewal. (Section 70.33(b)). If an application is received less than 30 days prior to the expiration date of your license and cannot be processed before your existing license expires, this could result in your possessing special nuclear material without a valid license.

If you do not wish to renew your license, please complete the enclosed form "Certification of Status of Special Nuclear Material Activities Under United States Atomic Energy Commission Special Nuclear Material License Number-35", and return it to this office.

If you have obtained an amendment which has extended the expiration date of the above license or if a new license has been issued which supersedes the above license, please disregard this notice.

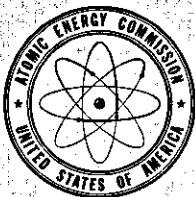
This notice of your license expiration is sent for your convenience and it should not be interpreted that similar notices will be sent in the future. The responsibility for timely submission of an application for license renewal remains with the licensee.

Very truly yours,

Donald A. Nussbaumer

Donald A. Nussbaumer, Chief
Source & Special Nuclear Materials Branch
Division of Materials Licensing

Enclosure:
"Certification . . ."



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

CERTIFICATION OF STATUS OF SPECIAL NUCLEAR MATERIAL ACTIVITIES
UNITED STATES ATOMIC ENERGY COMMISSION

LICENSE NUMBER SNM-

LICENSEE:

ADDRESS:

The licensee and any individual executing this certification on behalf of the licensee certify that (check appropriate item(s) below):

☐ No special nuclear materials have been procured and/or possessed by licensee.

☐ All special nuclear materials procured and/or possessed by licensee under Special Nuclear Material License No. SNM- have:

☐ (1) been or will be prior to expiration of the above license transferred to _____
(Institution, firm, hospital, person, etc.)

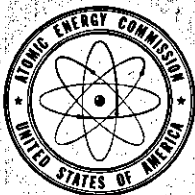
_____ which has Special Nuclear Material License No. SNM-

☐ (2) been or will be disposed of in compliance with 10 CFR 20 prior to expiration of this license.

Certifying Official

Date: _____

Please return 4 copies to:
U. S. Atomic Energy Commission
Division of Materials Licensing
Washington, D. C. 20545



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

CERTIFICATION OF STATUS OF SPECIAL NUCLEAR MATERIAL ACTIVITIES
UNITED STATES ATOMIC ENERGY COMMISSION

LICENSE NUMBER SNM-

LICENSEE:

ADDRESS:

The licensee and any individual executing this certification on behalf of the licensee certify that (check appropriate item(s) below):

 No special nuclear materials have been procured and/or possessed by licensee.

 All special nuclear materials procured and/or possessed by licensee under Special Nuclear Material License No. SNM- have:

 (1) been or will be prior to expiration of the above license transferred to _____
(Institution, firm, hospital, person, etc.)

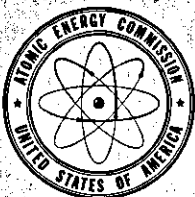
_____ which has Special Nuclear Material License No. SNM-

 (2) been or will be disposed of in compliance with 10 CFR 20 prior to expiration of this license.

Certifying Official

Date: _____

Please return 4 copies to:
U. S. Atomic Energy Commission
Division of Materials Licensing
Washington, D. C. 20545



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

CERTIFICATION OF STATUS OF SPECIAL NUCLEAR MATERIAL ACTIVITIES
UNITED STATES ATOMIC ENERGY COMMISSION

LICENSE NUMBER SNM-

LICENSEE:

ADDRESS:

The licensee and any individual executing this certification on behalf of the licensee certify that (check appropriate item(s) below):

 No special nuclear materials have been procured and/or possessed by licensee.

 All special nuclear materials procured and/or possessed by licensee under Special Nuclear Material License No. SNM- have:

 (1) been or will be prior to expiration of the above license transferred to _____
(Institution, firm, hospital, person, etc.)

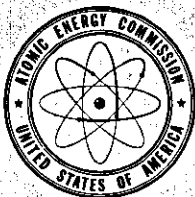
_____ which has Special Nuclear Material License No. SNM-

 (2) been or will be disposed of in compliance with 10 CFR 20 prior to expiration of this license.

Certifying Official

Date: _____

Please return 4 copies to:
U. S. Atomic Energy Commission
Division of Materials Licensing
Washington, D. C. 20545



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

CERTIFICATION OF STATUS OF SPECIAL NUCLEAR MATERIAL ACTIVITIES
UNITED STATES ATOMIC ENERGY COMMISSION

LICENSE NUMBER SNM-

LICENSEE:

ADDRESS:

The licensee and any individual executing this certification on behalf of the licensee certify that (check appropriate item(s) below):

☐ No special nuclear materials have been procured and/or possessed by licensee.

☐ All special nuclear materials procured and/or possessed by licensee under Special Nuclear Material License No. SNM- have:

☐ (1) been or will be prior to expiration of the above license transferred to _____
(Institution, firm, hospital, person, etc.)

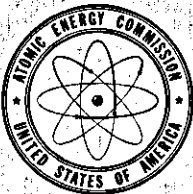
_____ which has Special Nuclear Material License No. SNM-

☐ (2) been or will be disposed of in compliance with 10 CFR 20 prior to expiration of this license.

Certifying Official

Date: _____

Please return 4 copies to:
U. S. Atomic Energy Commission
Division of Materials Licensing
Washington, D. C. 20545



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

CERTIFICATION OF STATUS OF SPECIAL NUCLEAR MATERIAL ACTIVITIES
UNITED STATES ATOMIC ENERGY COMMISSION

LICENSE NUMBER SNM-

LICENSEE:

ADDRESS:

The licensee and any individual executing this certification on behalf of the licensee certify that (check appropriate item(s) below):

 No special nuclear materials have been procured and/or possessed by licensee.

 All special nuclear materials procured and/or possessed by licensee under Special Nuclear Material License No. SNM- have:

 (1) been or will be prior to expiration of the above license transferred to _____
(Institution, firm, hospital, person, etc.)

_____ which has Special Nuclear Material License No. SNM-

 (2) been or will be disposed of in compliance with 10 CFR 20 prior to expiration of this license.

Certifying Official

Date: _____

Please return 4 copies to:
U. S. Atomic Energy Commission
Division of Materials Licensing
Washington, D. C. 20545

9900

Ser 72 - 0516

MAR 29 1968

FIRST ENDORSEMENT ON USNRDL LETTER 730-254 AK:kmm OF 22 MARCH 1968

From: Commander, Naval Electronic Systems Command
To: Chief, Source & Special Nuclear Materials Branch
Division of Materials Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subj: AEC Special Nuclear Material License No. ENM-35

1. Basic letter with enclosures contains a request to amend subject license to increase the possession limit from five to fifty-five grams of Plutonium-238 in any chemical or physical form.
2. Details of studies using the Plutonium-238 in the Laboratory's Research & Development Program are covered in attached enclosures to the Naval Radiological Defense Laboratory's letter.

M. G. WILLIAMS
By Direction

Copy to:
BUMED (Code 74)
NRDL, SFRAN

MAHAFFEY/ford
61457 - 3/29/68
0326-099-68

U. S. Naval Radiological Defense Laboratory
San Francisco 24, California

730-254
AK:kmm

22 MAR 1968

AIRMAIL

Str. recd. on 3/28/68 & fwded

by 1st Encl., ser. 0516 —, of — Mar. 1968.

From: Commanding Officer and Director
To: Chief, Source and Special Nuclear Materials Branch, Division
of Materials Licensing, U. S. Atomic Energy Commission,
Washington, D. C. 20545
Via: Commander, Naval Electronic Systems Command (Code 05163),
Munitions Building, 18th & Constitution Avenues, Washington,
D. C. 20390

Subj: AEC Special Nuclear Material License No. SNM-35; request
for amendment to

Ref: (a) NRDL ltr 730-89 AK:jp of 29 Dec 1964
(b) NRDL ltr 730-29 ALS:jp of 20 Apr 1965

Encl: (1) Revised Title Page
(2) Revised Page 1a

1. It is requested that the U. S. Naval Radiological Defense Laboratory's Special Nuclear Material License be amended to increase the possession limit of Plutonium-238 in any chemical or physical form from five (5) grams to fifty-five (55) grams.

2. Material will be used as stated in enclosures (1) and (2) and under the conditions and procedures as stated in references (a) and (b).

3. It is requested that enclosures (1) and (2) replace title page and page 1a of enclosure (1) of reference (a).

W. E. CAMPBELL, Jr.
Acting

Copy to:
BUMED (Code 74) (w/encs)

APPLICATION FOR RENEWAL OF SNM-35

I. GENERAL INFORMATION

A. Introduction

The U. S. Naval Radiological Defense Laboratory is located in the San Francisco Bay Navy Shipyard, Building 815, Hunters Point Division, San Francisco, California 94135. Facilities are also located at other buildings in the Shipyard area. It also has facilities at Camp Parks, a deactivated Army base, near Pleasanton, California. All Special Nuclear Materials will be possessed and used by the U. S. Naval Radiological Defense Laboratory and may also be used at Navy, Army and Air Force facilities provided such use is under the direct supervision and control of the U. S. Naval Radiological Defense Laboratory personnel and in accordance with procedures established by the Radioisotope Committee of the U. S. Naval Radiological Defense Laboratory. It may be sent out to other Atomic Energy Commission licensed activities.

The U. S. Naval Radiological Defense Laboratory is a Laboratory engaged in basic and applied research on the physical, chemical and biological effects of nuclear and thermal radiation, with particular emphasis upon those factors relating to the requirement of the military services.

B. Types and Quantities of Special Nuclear Material

The Special Nuclear Material will be possessed and used as follows:

^{238}Be Pu-238	sealed neutron sources	20 grams
--------------------------------------	------------------------	----------

These sources will be manufactured by the Monsanto Research Corporation, Dayton, Ohio in accordance with the specifications listed in Appendix A. They will be used in the Laboratory's bio-medical program for animal neutron irradiation studies.

Enclosure (1)

Amendment 5

Pu²³⁸

55 grams

Any chemical or physical form. Milligram quantities will be used to study the chemical and physical characteristics of plutonium and as target material in reactor and/or particle accelerator irradiations at AEC licensed activities. Gram amounts will be used to determine solubility rates of alloys of plutonium with other elements. In particular, the ROVER/NERVA program, AEC Project No. Q-43040-03-01, "Radionuclides Released to Sea Water from Nuclear Powered Sources", and the Space Electronic Power Office program, AEC Project No. Q-43019-01-01, "Marine Environment Test Station", are examples of such studies.

Pu²³⁹

2000grams

Any chemical or physical form. (Note: 1018.054 grams in sealed PuBe/PuF₄ neutron sources presently on hand. PuBe sealed sources range from one (1) gram to eighty (80) grams each. PuF₄ is 760 grams.)

1a

Enclosure (2)

Amendment 5



DEPARTMENT OF THE NAVY
NAVAL ELECTRONIC SYSTEMS COMMAND
WASHINGTON, D.C. 20360

IN REPLY REFER TO

9673

Ser 272 - 0516

MAR 5 1968

From: Commander, Naval Electronic Systems Command
To: Chief of Naval Material
Department of the Navy
Washington, D. C. 20360
ATTN: Code 04124

Subj: Projected Requirements for Special Nuclear Materials

Ref: (a) CNM 1ST END MAT 04124:JJBII of 21 February 1968 (to CNO
ltr OP-755/chc Ser 49P75 of 13 February 1968)

Encl: (1) Special Nuclear Material Requirements for Neutron Instrument
Calibrators
(2) Special Nuclear Material Requirements for Alpha Instrument
Calibrators

1. The subject requirements for the Naval Electronic Systems Command
are forwarded as enclosures (1) and (2) in accordance with reference (a).

M. G. WILLIAMS
By Direction

Copy to:
NAVFAC (FAC-042) (w/encls)

ELEX 051 (w/encls)

ELEX 05163 (w/encls) ←

MAR 5 1968

Neutron Radiac Calibrators Each Using 80 Gram PuBe Source

Program Element & Name	Vehicle & Appropriate Program Element	Element Pu ²³⁹	Enrich. Wt. Pu ²³⁹ (100%)
31415012 (1) Submarines	(1) AS-6901 (1) AS-7101 (1) * AS-7301 (1) * AS-7501 (1) * AS-7701		
32015012 (2) Destroyers	(2) AD-6801 (2) AD-6901		
33205012 (3) Ship Support	(3) San Francisco Bay Naval Shipyard (3) 2 Replacements		

* Not yet in shipbuilding.

FY-69			FY-70			FY-71		
Invent	Replace	Pipeline	Invent	Replace	Pipeline	Invent	Replace	Pipeline
2000	240	560	2160	240	400	2320	240	240

FY-72			FY-73			FY-74		
Invent	Replace	Pipeline	Invent	Replace	Pipeline	Invent	Replace	Pipeline
2400	240	160	2560	240	0	2560	240	0

FY-75			FY-76			FY-77		
Invent	Replace	Pipeline	Invent	Replace	Pipeline	Invent	Replace	Pipeline
2560	240	0	2560	240	0	2640	160	0

Definition: Inventory - In operational use.
 Replacement - In stock.
 Pipeline - In contract or planning stage.

Encl (1) to NAVELEX Ser 272 -0516

MAR 5 1968

JUSTIFICATION:

The Plutonium to be obtained as outlined above is for Neutron Calibration Sets, Nomenclature AN/UDM-5(), used by ship and shore repair facilities to calibrate neutron instrumentation used for shield survey work in nuclear reactor compartments, by personnel in research efforts and by industrial hygienists in safety programs. Each calibrator contains a quantity of one 80 gram (5 curie) PuBe source. Each facility, ship and shore, has only one calibrator.

Encl (1) to NAVELEX Ser 272-0516

MAR 5 1968

Alpha Radiac Calibrators Each Using 0.9 Milligram Pu in PuCl₃ Form

Program Element & Name	Vehicle & Appropriate Element	Element	Erich. Wt.
31415012 (1) Submarines	(1) AS-37 (1) AS-6901 (1) AS-7101	Pu ²³⁹	Pu ²³⁹ (100%)
32015012 (2) Destroyers	(1) * AS-7301 (1) * AS-7501 (1) * AS-7701		
33205012 (3) Ship Support	(2) AD-6801 (2) AD-6901 (4) CVAN-6701		
31205000 (4) Attack Carriers	(4) CVAN-6901 (4) CVAN-7101 (4) *CVAN-7301 (4) *CVAN-7501 (3) 20 Radiac Repair Vans (Navy) [2/yr] (3) 20 Radiac Repair Vans (MC) [2/yr] (3) 50 Replacements [5/yr] (3) New London Repair Facility (3) 15 Unprogrammed Requirements (Laboratory & Contractor GFP)		

* Not yet in shipbuilding program.

FY-69			FY-70			FY-71		
Invent	Replace	Pipeline	Invent	Replace	Pipeline	Invent	Replace	Pipeline
54.0	48.6	40.5	57.6	40.5	40.5	61.2	32.4	40.5

FY-72			FY-73			FY-74		
Invent	Replace	Pipeline	Invent	Replace	Pipeline	Invent	Replace	Pipeline
64.8	24.3	40.5	68.4	16.2	40.5	72.0	48.6	0

FY-75			FY-76			FY-77		
Invent	Replace	Pipeline	Invent	Replace	Pipeline	Invent	Replace	Pipeline
75.6	40.5	0	79.2	32.4	0	80.1	31.5	0

Enclosure (2) to NAVELEX Ser 272-0516

MAR 5 1968

Definitions: Inventory - In operational use.
Replacements - In stock.
Pipeline - In contract or planning stage.

JUSTIFICATION:

The Plutonium to be obtained as outlined above is for Alpha Calibrator Sets, Nomenclature AN/UDM-7(), used by ship and shore repair facilities to calibrate alpha instrumentation used for nuclear accident clean-up operations and by industrial hygienists in other safety programs where alpha contamination can conceivably occur.

Each calibrator contains a quantity of 0.9 milligrams (55 microcuries) of Plutonium deposited in a resin compound. Each facility listed above, ship and shore, has only one calibrator.

Enclosure (2) to NAVELEX Ser 272-0516

U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY
SAN FRANCISCO, CALIFORNIA 94135

IN REPLY REFER TO:

730-134

AK/TRB:kmm

7 SEP 1967

AIRMAIL

This Copy Rec'd. 9/14/67

From: Commanding Officer and Director
To: Director, Division of Reactor Development and Technology,
U. S. Atomic Energy Commission, Washington, D. C. 20545
Subj: Plutonium-238 microspheres; request for

1. In order for the U. S. Naval Radiological Laboratory to continue its investigation of the solubility of plutonium microspheres in sea water, approximately twenty-five (25) milligrams of Plutonium-238 microspheres of the type previously furnished and presently available from Mound Laboratory, Monsanto Research Corporation, Miamisburg, Ohio are required.
2. It is requested that authorization be granted Mound Laboratory for the release of this material to the U. S. Naval Radiological Defense Laboratory (NRDL). This work at NRDL is being carried out under AEC Project No. Q-43019-01-01, Contract No. AT (49-5)-2084.
3. NRDL's Special Nuclear Material Interagency Agreement Number 1001 and Special Nuclear Material License No. is SNM-35.

T. R. BIRDWELL
By direction

Copy to:

NAVELECSYSCOM (Code 05163)

USAEC (SFOO)

Mound Laboratory, Miamisburg, Ohio (Messrs. D. Carfagno and M. N. Wolfe), Drs. G. R. Grove, D. P. Kelly, and C. Henderson.
Mr. W. B. Creamer, USAEC, Dayton Area Office, Miamisburg, Ohio
Mr. W. K. Kern, USAEC, Isotopes Development, Germantown, Md.

AUG 2 1967

Recd. 8/4/67

Commanding Officer and Director
U. S. Naval Radiological Defense Laboratory
San Francisco, California 94135

Attention: M. I. Varon

Dear Sir:

As requested in your letter 730-120, AK:kmm, dated July 19, 1967, you are authorized to obtain 100 grams of Uranium-235 enriched to 93.17% in the form of thin foil, under your license SNM-35.

Arrangements for the procurement of this material should be made through the AEC Materials Leasing Officer, Oak Ridge Operations Office, Post Office Box E, Oak Ridge, Tennessee 37831.

Very truly yours,

Original signed by
Delmar L. Crowson

Delmar L. Crowson, Director
Office of Safeguards and Materials
Management

cc: Naval Electronic Systems Command ✓